




OPEN SPACE MANAGEMENT GUIDE

Building Community Capacity to Program FEMA-Funded Housing Buyout Land

Acknowledgements

U.S. Department of Homeland Security. This guide is based upon work supported by the U.S. Department of Homeland Security under Grant Award Number 2015-ST-061-ND0001-01. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security.

Coastal Resilience Center of Excellence. Thanks to the Coastal Resilience Center of Excellence who provided funding through the Department of Homeland Security grant to support this work.

Advisory Board. A special thanks to members of our advisory board (see Appendix 4) who provided meaningful input that strengthened this document. Any limitations are solely the responsibility of the research team.

The Research Team. Members of the research team responsible for the writing of this document:

Gavin Smith, Ph.D., AICP. Professor, Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Abigail Black, Project Manager and master's student. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Claire Henkel, Project Manager and master's student. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Andy Fox, FASLA. Professor, Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Travis Klondike, Assistant Research Professor. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Brian Vaughn, Project Manager and master's student. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Chitali Biswas, master's student. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Samata Gyawali, master's student. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Samiksha Bhattarhai, master's student. Department of Landscape Architecture and Environmental Planning. North Carolina State University.

Table of Contents

Table of Contents

Table of Contents

Appendices

Figures

Images

Introduction

Disaster-related losses continue to rise across the United States and these losses are increasing rapidly due to climate change. As federal, state, and local government officials seek to develop strategies to reduce these losses, it is widely recognized that the acquisition of hazard-prone housing (i.e., "buyouts") and the conversion of the land to open space represents one of the most effective risk reduction and adaptation techniques. Significant attention has been placed on developing educational and training materials tied to the development and implementation of buyout grant programs. However, limited consideration has been given to the assemblage of useful information and the creation of actionable guidance that informs communities about how to develop and implement an open space management strategy for buyout lands. The Open Space Management Guide seeks to fill that void. While this guide is focused on buyouts funded by the Federal Emergency Management Agency (FEMA), many of the lessons provided are applicable to the growing number of state and locally supported buyout programs, several of which are discussed in this document.

What is a Buyout?

The buyout process, depicted in Figure 1, is comprised of several steps, including the management of the resulting open space as shown in Figure 4. The buyout process typically begins when an affected community recognizes the presence of at-risk properties and decides to identify a prospective buyout site(s). This requires engaging with prospective buyout participants to assess their interest in the program and to inform them about the overall process. Once eligible properties are identified, their pre-disaster value is determined, title searches are conducted, and an offer to purchase the property is made. The house is demolished, or in some cases relocated to another location, and the land is converted to open space in perpetuity. It is the responsibility of the local government to determine the strategy used to manage the land once acquired. For more information about the buyout process, see documents provided in Appendix 2.

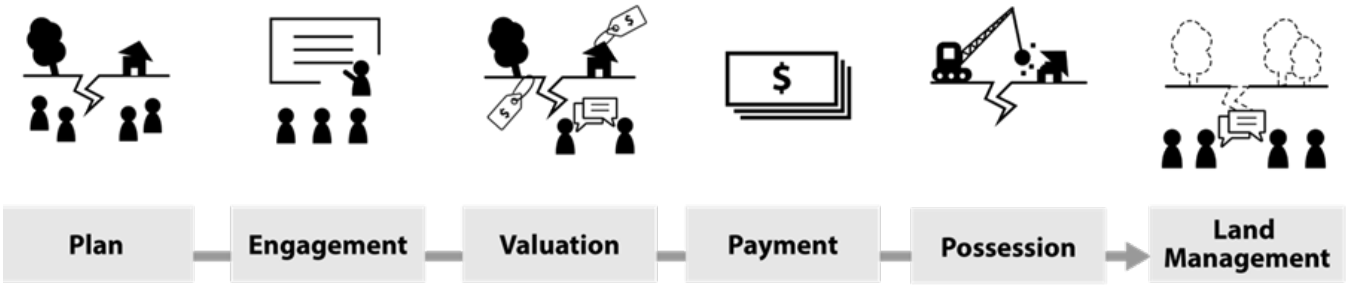


Figure 1. The Buyout Process. Credit: Image from *A Comparative Review of Hazard-Prone Housing Acquisition Laws, Policies, and Programs in the United States and Aotearoa, New Zealand: Opportunities to Improve Practice*. Gavin Smith and Wendy Saunders, 2022.

How is this Guide Different from Existing Materials?

This guide is based on three interrelated parts: 1) applying land use planning and landscape design procedures and processes; 2) framing open space management design, implementation, and long-term maintenance within FEMA's buyout rules and regulations; and 3) describing the supporting resources (funding, policy, and technical assistance) needed to develop and implement an open space management strategy.

Currently, FEMA does not provide funding or technical assistance to support the development and implementation of an open space management strategy, which has proved challenging for many communities with less financial, technical, and administrative capacity. The Open Space Management Guide is designed to address this challenge by describing a broader set of resources that are available to communities. Drawing on techniques and processes found in land use planning and landscape architecture empowers communities to transform buyout properties into a community asset that aligns with recreation, economic development, environmental stewardship, hazard risk reduction, and other goals advanced by a network of partners.

Who is the Intended Audience?

The guide is written for local government officials in urban, suburban, and rural areas including those communities possessing varied levels of financial, technical, and administrative capabilities. The guide is also intended for state and federal officials who provide supporting resources that local governments need to address open space management-related challenges. The emphasis on design-based options should appeal to landscape architects and land use planners who often take on this task as local officials or consultants. The materials are also intended to help residents, environmental and social justice non-profits, recreational groups, and others gain insights and inspire them to engage in the open space management process. Describing the array of stakeholders that have a role to play in this process, including those that may not be familiar to individuals tasked with administering an open space management strategy, is meant to highlight the importance of creating an inclusive open space management team (see Checklist: Creating an Open Space Management Team).

How to Use this Guide?

The guide includes checklists, tips, process diagrams, matrices, case studies, and call-out boxes spanning a range of issues and tasks associated with open space management. Case studies, which are found throughout the document, highlight key issues (categories) and sub issues (subcategories), thereby providing important contextual background for the reader. Additional resources are provided in the appendix, including a list of other open space management documents as well as templates that can be used to identify members of an open space management team and to track the resources needed to implement an open space management strategy.

Case Studies: Case studies provide a two-page community-specific narrative highlighting one or more open space management topics. Emphasis is placed on how certain actions were accomplished. Cases include a description of the topic(s) (i.e., leveraging resources, checkerboarding, multi-objective planning, memorialization), key takeaways, and references to relevant call-out boxes and tips in this guide. In some instances, relevant topics are explored in cases that are not directly associated with buyouts but provide useful insights. Cases are drawn from across the country to include urban, rural, and suburban locations as well as those communities possessing varied levels of fiscal, technical, and administrative capacity (Figure 2).

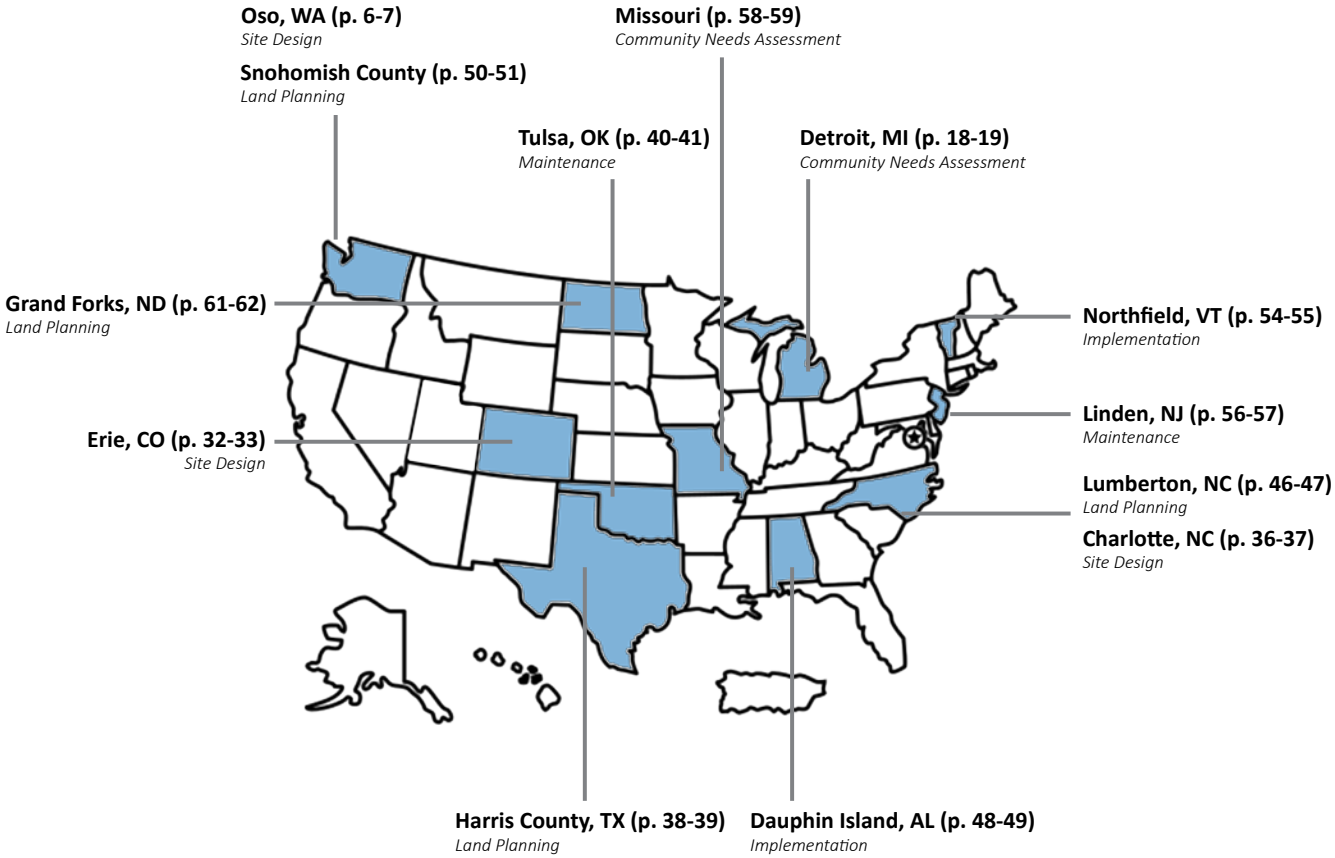


Figure 2. Case Study Site Map.

Cases address five themes and associated subcategories (Figure 3). Maintenance refers to the techniques used to address the upkeep and conservation of selected land uses in perpetuity. Land Planning refers to the forethought and processes used to develop, maintain, and implement open space management strategies over time. Site Design refers to the process of creating scopes of work and includes drawings depicting the physical and programmatic attributes of a project. Community Assessment refers to the evaluation of a community's attributes and how these factors inform the project. Implementation refers to the mechanisms put in place to ensure that the project is effectively constructed and managed over time, and includes the identification of the resources (funding, policies, and technical assistance) needed to accomplish specific tasks. For more information about how cases were selected, see Appendix 3: Guide Development.

Process Diagrams: Diagrams depict complex processes and distill ideas into easily understood images, including a set of steps required to address larger issues. For example, a diagram depicts the open space management process, including its varied components, each of which are discussed throughout the guide (Figure 4).

Checklists: Checklists provide itemized lists of information that communities may use to tackle an issue. Examples include a list of questions local officials might pose to prospective consultants tasked with the development and implementation of an open space management strategy, and a list of departmental, agency, and organizational representatives a community may want to include on their open space management team.

Case Studies	Theme	Subcategory
Oso, WA	Site Design	Memorialization
Detroit, MI	Community Needs Assessment	Environmental Justice
Erie, CO	Site Design	Environmental Design
Charlotte/Mecklenburg, NC	Site Design	Multi-Objective Planning
Harris County, TX	Implementation	Conveying Complex Funding
Tulsa, OK	Maintenance	Creative Funding Strategies
Lumberton, NC	Land Planning	Assistance from Committed Partners
Dauphin Island, AL	Implementation	Neighborhood Parks/Checkerboarding
Snohomish County, WA	Land Planning	Ecological Restoration/Checkerboarding
Northfield, VT	Implementation	Diverse Partnerships
Linden, NJ	Maintenance	Ecological Restoration
State of Missouri	Community Needs Assessment	Applying FEMA's Community Rating System (CRS)
Grand Forks, ND	Land Planning	Diverse Partnerships

Figure 3. Case Studies: Themes and Subcategories.

Tips: Tips provide brief insights on topics that warrant serious consideration by those involved with developing an open space management strategy, references to documents that may be used by members of the open space management team, and "food for thought" for those tasked with open space management activities. Examples include a discussion of the potential use of consultants and a description of how open space management activities can reduce the flood insurance rates of policyholders in communities that participate in the National Flood Insurance Program's Community Rating System.

Matrices: Matrices represent a tabular display of two or more topics, emphasizing their relationships. For example, in the Open Space Management Resource Matrix, key open space management actions are identified and spaces are provided for communities to describe the resources (funding, policies, and technical assistance) needed to address each action and the organization and/or team member responsible for carrying this out (Figure 6).

Call-Out Boxes: Call-out boxes are used to describe broader open space management-related issues. Examples include a description of the legal issues tied to the management of open space, the identification of complementary community goals that align with an open space management strategy, and how to contract open space management consulting services.

Appendices: Appendices include materials that are intended to supplement information found in the body of the guide. For instance, templates are provided for use by those tasked with the development of an open space management team and the identification and tracking of resources needed to accomplish varied tasks. Appendices also include a summary of the academic and practice-based literature, a list of additional open space management materials, the approach used to create this guide, and a list of advisory board members.

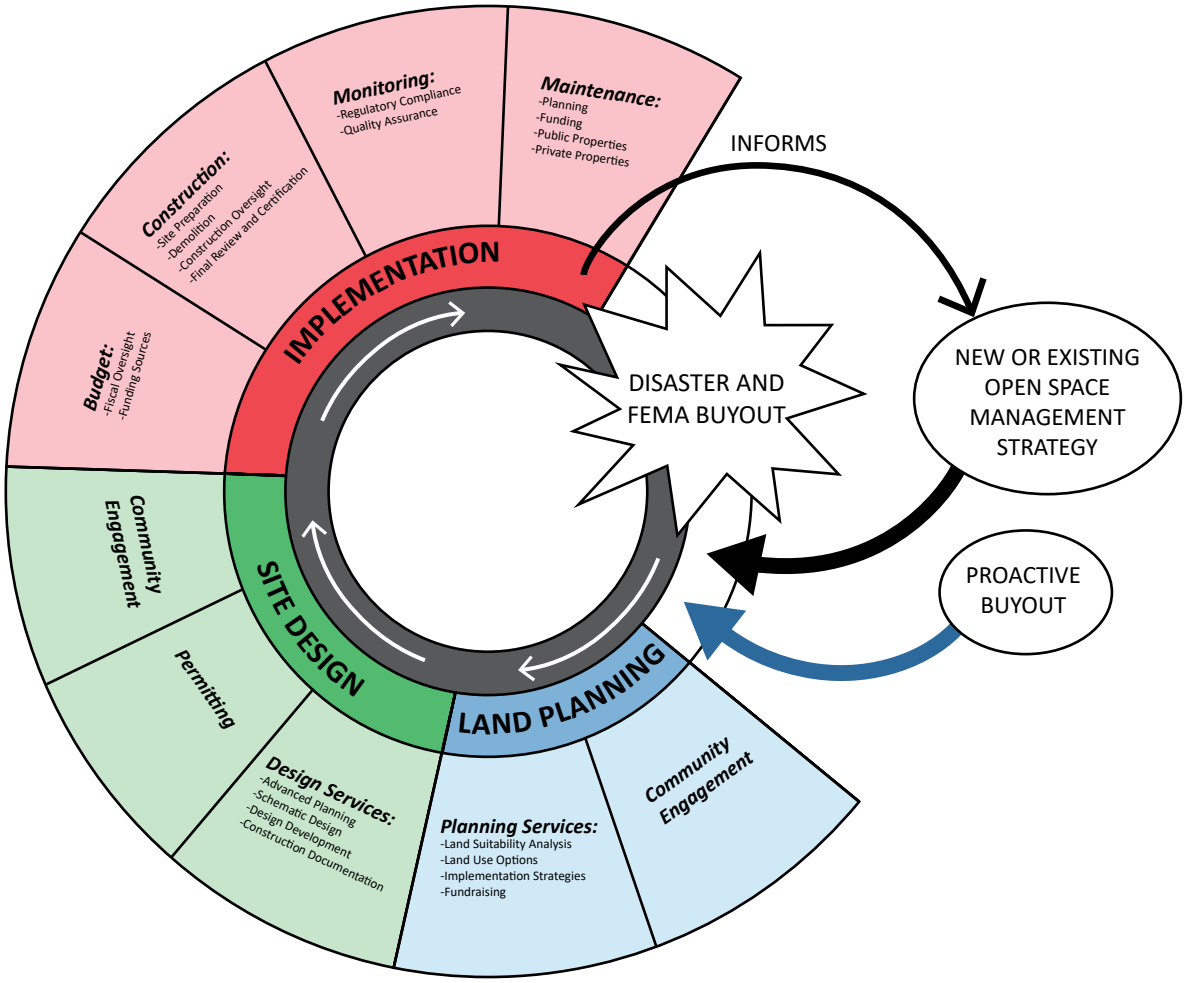


Figure 4. Open Space Management Process. A more detailed narrative describing the tasks (land planning, site design, and implementation) as well as their associated components and subcomponents are found in the Call-Out Box: Contracting Services for Open Space Management.

Buyouts and the Open Space Management Process

The diagram shown in Figure 4 depicts the open space management process, to include actions taken in both pre- and post-disaster time frames. Ideally an open space management strategy is developed before a disaster occurs. A proactive approach allows the community more time to assess the situation, solicit and sustain public input, garner necessary resources, and develop design options that inform the implementation and maintenance of an open space management strategy over time. Many communities develop a plan of action after a buyout has begun, and as a result, have less time to identify the resources needed to create a thoughtful open space management strategy. This includes developing an inclusive participatory process among residents who participate in the buyout as well as a larger open space management team (see Checklist: Creating an Open Space Management Team).

Some communities fail to plan for what will be done with the land after it is acquired. The inability to identify needed support up front or after a buyout has occurred often results in missed opportunities and the open space frequently becomes a financial and administrative burden rather than a community asset. Throughout the guide, examples are provided describing how the resulting open space can serve to create a range of community assets, including the commemoration of a community that was once there, as described next in the Oso, WA case study.

OSO, WASHINGTON

CATEGORY: Site Design
SUBCATEGORY: Memorialization

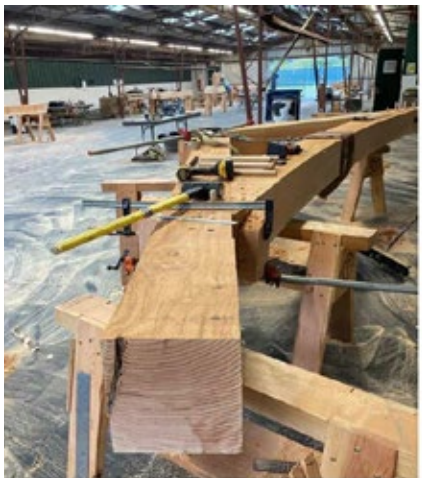
Introduction

The landslide, which struck Oso, WA in 2014, was one of the most devastating landslides in the history of the United States, destroying 49 houses in the community of Steelhead Haven and taking the lives of 43 people. More than 900 federal, state, and local volunteers assisted with search and rescue efforts and it took two years to remove the debris from the site.

With the help federal, state, and local funding, 100 parcels were acquired, of which thirteen were used to establish a memorial site dedicated to property owners that were directly affected by the landslide as well as those who provided assistance following the event.

The Oso Slide Memorial Committee, Snohomish County Parks and Recreation, and Minaker Architecture are working together to develop and implement an open space management strategy. The project is funded by the Washington State Department of Commerce, the Recreation and Conservation Office, and the Snohomish County Parks Donation Fund.

Oso, Washington Landslide Memorial Project Site. *Image: Memorial Project, Snohomish County.*



Materials selected by the designer for entryway monument. *Images: Memorial Project, Snohomish County.*

Case Study Focus:

Memorialization of a Disaster Through Landscape Design

The site design has been completed, including land set aside to memorialize those who lost their lives as well as surrounding properties that face significant flood risk along the North Fork of the Stillaguamish River, which will be restored to its natural state.

The memorial has been designed to reflect the natural beauty of the area, a feature that people enjoyed who once lived there.

Minaker Architecture developed a design of the memorial after consulting with the families, first responders, community members, and the Oso Slide Memorial Committee. Personalized metal panels, walking paths, a community gathering place, and restored wetlands are intended to create a space that fosters contemplation, community healing, and an educational experience for visitors.

Oso Landslide Site Design. *Image: Snohomish County.*

Key Takeaways:

- *Coordination among residents; local, state, and federal government officials; and the design firm who donated their time and expertise was critical to the success of the project.*
- *Memorialization of buyout sites can achieve commemorative, recreational, educational, and ecological objectives.*
- *Funding for memorials can be raised from multiple sources, including federal, state, and local governments, as well as non-governmental organizations.*

Checklist: Creating an Open Space Management Team

Most communities that have developed successful open space management strategies have identified, nurtured, and maintained diverse teams comprised of individuals and organizations within and outside their jurisdictions, assigned them clear responsibilities, and coordinated their actions over time. The creation and long-term maintenance of an open space management team requires an ongoing commitment to: 1) identify individuals and organizational representatives, 2) establish an organizational structure (i.e., task force, committee, or other type), 3) identify roles and responsibilities (including clear lines of authority and decision-making procedures), 4) monitor and report progress, 5) establish clear lines of communication among team members and the public, and 6) involve members of the community in the decision making process.

The type of organizational structure adopted by a community may be informed by other activities already underway. For instance, an open space management committee may be organized across functional areas like finance, planning and design, compliance/legal/contracting, communication and public engagement, and other issues as identified. An individual should be assigned to lead the overall effort and others tasked to oversee functional areas. In some cases, the group may decide to establish committees to address issues like memorialization, ecological restoration, organizing volunteer assistance, or environmental justice.

The hypothetical organizational structure depicted in Figure 5 reflects a community with staff or volunteers to fill these positions. In smaller jurisdictions this may prove difficult to achieve and it is incumbent on the community to identify individuals who can play these roles, such as county officials, quasi-governmental agency staff, or others as identified. It is up to those assuming leadership roles to think through these issues and create a team that works for their community's unique local conditions.

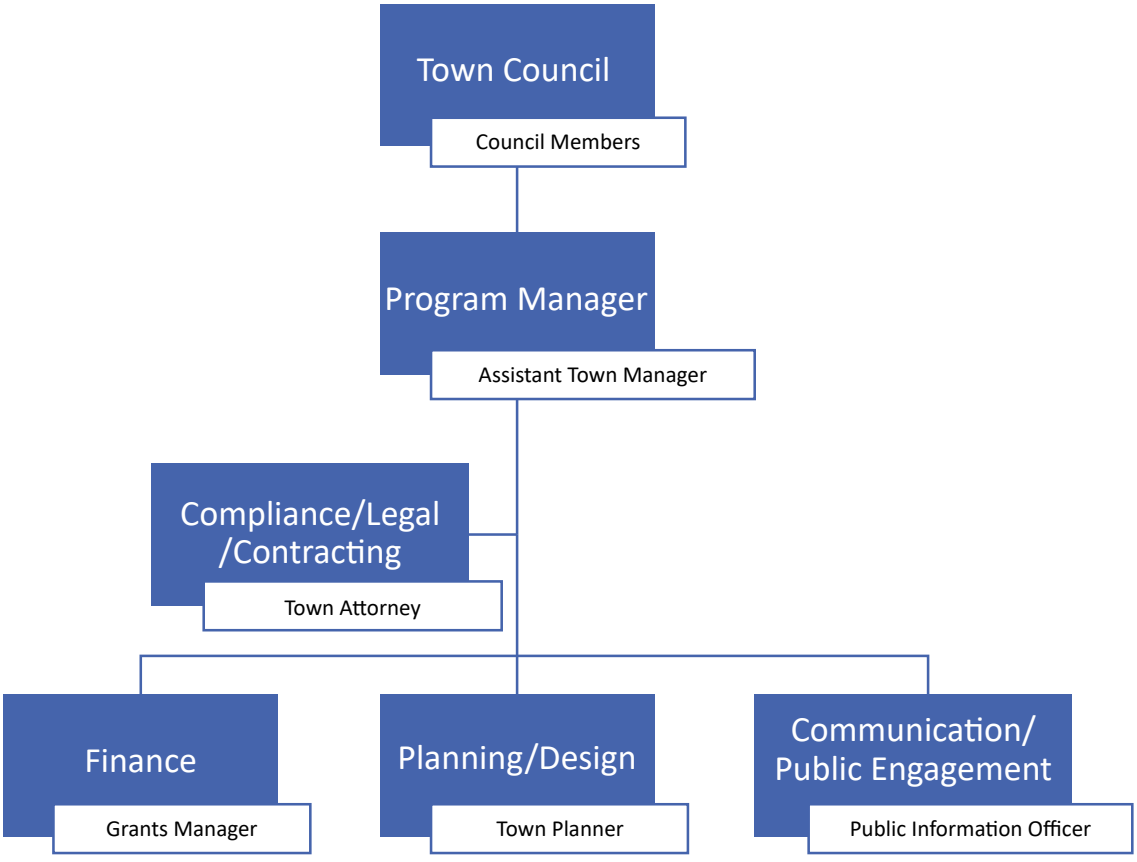


Figure 5. Hypothetical Open Space Management Organizational Structure.

The collection of individuals and organizations listed next represent potential members of an open space management team, whose makeup will vary depending on the unique conditions found in differing communities and the ability of leadership to identify those who are willing and committed to helping support the effort over time. The following list is organized across key organizational types, including local government officials, state agencies, federal agencies, regional organizations, community organizations, professional associations, non-profits, members of the private sector, individuals, other jurisdictions, and universities. Each member of the open space management team includes a brief description of their possible roles and responsibilities. The checklist is intended to start a discussion among community representatives and provide ideas for team membership and associated assignments. An Open Space Management Team Template is provided in Appendix 5 to help organize and assign team members.

Local Government Officials

- **Town / City / County / Parish Council Members** (approval of municipal financing /budgeting of open space management activities, contract approvals, policy approvals, political support).

- **Town / City / County Manager** (open space project oversight, creation of municipal budgets tied to open space management and other potentially complimentary programs, selection of contractors, project compliance). See Call-Out Box: Contracting Consulting Services for Open Space Management and Checklists: Questions to Ask During a Request for Proposal and Cost Estimation for Open Space Management Actions.

- **Assistant Town / City / County Manager** (open space project oversight, oversight of local government departments, selection of contractors, project compliance). See Call-Out Box: Contracting Consulting Services for Open Space Management and Checklists: Questions to Ask During a Request for Proposal and Cost Estimation for Open Space Management Actions.

- **Town Attorney** (review of legal issues tied to open space management, including FEMA-eligible land uses; contracts with private sector consultants). See Call-Out Box: Legal Aspects of Open Space Management.

- **Local Floodplain Administrator** (alignment of open space management strategy with ongoing flood risk reduction initiatives including the natural and beneficial functions of floodplains and compliance with Local Flood Damage Prevention Ordinance). See Call-Out Box: Identifying Goals in Community Plans that Align with Open Space Management; Tip: Benefits of Buyouts and Open Space – FEMA's Community Rating System; and Missouri Case Study – Needs Assessment: Applying FEMA's Community Rating System.

- **Town / City Planner** (integration of plans with open space management strategy, review of consultant proposals and design documents, potential project oversight, assist or lead community engagement, writing and oversight of hazard mitigation plan). See Call-Out Box: Identifying Goals in Community Plans that Align with Open Space Management.

- **Parks and Recreation Director** (alignment of open space strategy with greenways, parkland investments and plans, review open space proposals and design documents, possible project oversight). See Call-Out Box: Identifying Goals in Community Plans that Align with Open Space Management.

- **Public Works Director / Stormwater Management Director** (review design documents tied to the construction of water retention and other stormwater management features on buyout lands, alignment of open space management strategy with nature-based solutions).

- **Grants Manager** (writing and administration of grant(s) funding buyout and open space management activities, review of consultant proposals).

- **Emergency Manager** (primary point of contact with state emergency management agency who serves as pass-through organization for FEMA pre- and post-disaster Hazard Mitigation Assistance grants used to fund buyouts, often responsible for Hazard Mitigation Assistance grants management activities, writing and oversight of hazard mitigation plan).

- **Local Building Code Official** (review of open space construction documents, assess potential reuse of housing materials during deconstruction, code compliance on site, to include site certification and permit review/ approval).

- **Public Health Director** (assess potential reuse of housing materials during deconstruction; advocate for, develop, and disseminate information describing the health benefits of using open space for recreational purposes).

- **Department of Education** (alignment of open space management strategy with environmental and physical education initiatives undertaken by local schools).

- **Consultant** (write and implement open space management grant(s), conduct land suitability analysis, identify land use options, site preparation, develop construction and monitoring strategies). See Call-Out Box: Contracting Consulting Services for Open Space Management.

- **Local government officials** from other communities who have undertaken a buyout and developed and implemented an open space management strategy (provision of lessons and insights, identification of potential partners).

State Agencies

- **State Emergency Management** (grantee of FEMA buyout funds, including the Building Resilient Infrastructure and Communities grant that can be used to support nature-based solutions on or adjacent to buyout lands; point of contact for local governments regarding eligible uses of buyout lands).

- **State Environmental Management** (provider of grants that support open space management activities, conservation, and environmental education) Forester (advice on replanting open space with native trees, including those suitable to produce harvestable timber); State Parks (trail building expertise, potential transferal of land associated with large-scale buyouts to existing state parks).

- **State Agricultural Extension** (familiarity with native plant types suitable for buyout sites, soil testing of buyout areas, advice on the creation of natural areas on buyout lands).

- **Sea Grant** (assist communities through the sharing of data, tools, training, and community engagement; primary state agency aligned with the National Oceanic and Atmospheric Administration).

- **State Historic Preservation Office** (environmental review and recordation of state and local actions affecting historic properties and landscapes; technical assistance provided to local governments regarding the preservation of historic properties and landscapes; archive of historic properties and landscape images, field notes, and reports that can be used to inform commemorative site design options).

- **State Economic Development** (provider of grants that support open space activities if they can be shown to foster economic development, grantee for Housing and Urban Development grants like Community Development Block Grant – Hazard Mitigation

[CDBG-MIT] and Community Development Block Grant – Disaster Recovery [CDBG-DR] that can be used to acquire hazard-prone housing).

- **State Department of Public Health** (provider of information linking public health and recreational uses on open space lands, assess suitability of reusable housing materials associated with deconstruction activities).

Federal Agencies

- **Federal Emergency Management Agency** (grantee of several funds used to acquire hazard-prone properties, including the Hazard Mitigation Grant Program, Flood Mitigation Assistance, and Building Resilient and Infrastructure and Communities; lead federal agency responsible for the oversight of state and local hazard mitigation plans; provider of rules governing the eligible uses of FEMA-funded buyout lands).

- **National Oceanic and Atmospheric Administration** (provider of data, tools, and training through the Digital Coast Initiative [see https://coast.noaa.gov] to inform buyout options in coastal areas; provider of the sea level rise viewer, a tool used to visualize projected sea level rise in coastal areas; provider of the Community Rating System Explorer, a tool used to assess the value of open space management relative to the CRS program). See Tip: Benefits of Buyouts and Open Space – FEMA's Community Rating System.

- **US Department of Housing and Urban Development** (grantee responsible for the oversight of CDBG-DR and CDBG-MIT funds; provider of rules governing the eligible uses of HUD-funded buyouts, which are sometimes undertaken in conjunction with FEMA-funded buyouts).

- **National Parks Service** (provider of technical assistance through the National Park Service Rivers, Trails, and Conservation Assistance program to help create greenways and trails). See the document Assisting Communities with Natural Disaster Recovery at https://www.nps.gov/orgs/rtca/natural-disasters.htm.

- **US Army Corps of Engineers** (provider of technical assistance, including engineering studies assessing the flood risk reduction benefits associated with the conversion of open space to wetlands or water retention areas; provider of funding to acquire flood-prone lands; administration of programs funding the restoration of wetlands and coastal high hazard areas; coordinator of the Silver Jackets program which includes state-led teams of experts to assist communities access data and information spanning federal, state, and local agencies). See https://silverjackets.nfrmp.us.

Regional Organizations

- **Regional Planning Organization** (writing and implementation of grants; provider of land use, multi-objective planning, and economic development expertise – especially useful for smaller jurisdictions with limited staff and expertise). See Northfield, VT case study.

- **Watershed Planning District** (provider of advice on open space management as part of a larger regional watershed planning effort).

- **Soil Conservation District** (provider of advice on how buyout lands can be used to reduce soil erosion).

- **Regional Arboretums** (provider of advice and expertise regarding plant care, including indigenous trees and other woody plants).

Community Organizations

- **Neighborhood group(s)** (provider of input on commemorative site design as well as other buyout land uses, to include developing an open space management strategy that reflects community values).

- **Garden club** (planting and maintenance of native and non-native plants, xeriscaping, plant sale to raise funds for open space equipment and maintenance).

- **Historic Society** (record of historic properties and landscapes; input on commemoration of the buyout site, to include providing a recorded history of the area that could be used during the planning and design phases of the project).

- **Arts Council** (donation of commemorative public art for the buyout site, sale of art to raise funds for open space management activities).

- **Homeowners Association** (donated labor, community input, especially in areas slated for buyout).

- **Informal groups** that emerge after a disaster (provide a voice for individuals that have been excluded from decision making processes in the past).

Professional Associations

- **Association of State Floodplain Managers** (provision of technical expertise related to the natural and beneficial functions of floodplains, buyouts as a flood risk reduction measure, linkage between a jurisdiction's Local Flood Damage Prevention Ordinance and uses of buyout land, linkage between open space and CRS benefits).

- **American Society of Landscape Architects** (donation of technical expertise tied to the development of open space management design components). See: Climate Action Now: A Landscape Architect's Guide to Climate Advocacy at: https://www.asla.org/uploadedFiles/CMS/About__Us/Climate_Action/ClimateGuide.pdf.

- **American Planning Association** (donation of technical expertise tied to open space management planning). See: Hazard Mitigation and Disaster Recovery Planning Division at: https://www.planning.org/divisions/hazardmitigation/. See: Community Planning Assistance Teams www.planning.org/cpat/, including Lyons, Colorado CPAT focused on post-buyout open space ideas at: https://planning-org-uploaded-media.s3.amazonaws.com/publication/download_pdf/Living-With-the-Saint-Vrain.pdf.

- **American Institute of Architects** (donation of expertise in open space design, including structures placed on the site). See: Regional and Urban Design Assistance Team (R/UDAT) and AIA/CCD Center for Community Design at https://content.aia.org/sites/default/files/2016-04/RUDAT-Guide.pdf. See: Disaster Assistance Program at: https://www.aia.org/resources/69766-disaster-assistance-program. See: AIA Resilience form to join Network at: https://form.jotform.com/213124195967057.

- **International Society of Arboriculture** (provider of research and educational opportunities for tree care professionals, educational information for the public regarding tree care, and repository of professionally certified arborists across the United States). See: website at https://www.isa-arbor.com.

Non-profits

- **Land Trusts** (provider of land acquisition and management expertise, environmental stewardship, and education). Local land trusts may be best suited to land holdings at the parcel or neighborhood scale, whereas bigger projects are more likely to attract larger land trust participation. See Call-Out Box: The Potential Role of Land Trusts in Open Space Management.

- **Environmental groups** (provider of land management, environmental education, and ecosystem management expertise).

- **Social justice groups** (ensure robust community engagement among marginalized

populations, including those whose homes were bought out).

- **Faith-based groups** (provider of volunteer labor such as the construction of trails, benches, and park equipment; open space maintenance; community engagement among marginalized populations).

- **Recreational groups** (provider of volunteer labor, including trail building and maintenance of greenways, hosting of outings in open spaces).

Individuals

- **Local Artists** (commemorative public art sold or donated to support open space management activities).

- **Local Tradespeople** (deconstruction of houses; construction of boardwalks, gazebos, benches, retaining walls, public shelters).

- **Buyout participants** and other members of the community (community engagement; participate in the development of open space management goals and design options; donated labor, maintenance of checkerboarded buyout parcels).

Other Jurisdictions

- **Nearby communities** (provider of volunteer labor, fundraising).

- **Communities** that have experienced disasters and undertaken buyouts, including open space management (provider of peer-to-peer guidance, tips, lessons, psychological support, and encouragement).

Universities

- **Land Use Planning Department** (provider of expertise in land use law, site planning, multi-objective planning). Communities may ask faculty to host design studio course focused on open space management. See Call-Out Box: Identifying Goals in Community Plans that Align with Open Space Management Strategy.

- **Landscape Architecture Department** (provider of expertise in parks and recreation planning, open space planning, review and writing of open space management strategy solicitations and scopes of work, volunteer labor from students and faculty). Communities may ask faculty to host design studio courses focused on open space management. See Call-Out Box: Contracting Services for Open Space Management; Lumberton, NC case study).

- **Horticulture Department** (provider of expertise in plant selection, community garden design, garden maintenance, volunteer student and faculty labor).

- **Civil Engineering Department** (provider of expertise tied to stormwater management design, to include conducting hydraulic analyses assessing the impact of open space on adjacent housing and infrastructure; conducting losses avoided studies). See Linden, NJ case study.

- **Emergency Management and Homeland Security Departments** (provider of expertise on FEMA buyout programs, including issues surrounding open space management).

- **Parks and Recreation Department** (provider of expertise in park planning, financing, community engagement, and long-term management of parkland and other recreational facilities).

- **Sociology and Anthropology Departments** (provider of expertise on community engagement).

Private Sector

- **Home Improvement Center** (donation of tools, supplies, and building materials; donation of volunteer labor and money).

- **Garden Center** (donation or sale of plants, soil, fertilizer, tools; provider of donated labor).

- **Corporations** (monetary and labor donations, including business sponsored employee service events; provider of expertise, including financial management).

- **Small Business Owners** (community fundraising – percent of sales donated to open space management activities).

- **Landscaping Company** (provider of labor, plants, and materials like mulch; provider of open space design drawings; installation of plantings and implementation of design plans).

- **Consultants, including Landscape Architecture, Planning, Architecture, and Engineering firms** (provider of expertise, including review and creation of open space designs, land planning, construction, and stormwater management to include water retention areas and wetlands construction).

Next, a series of tips and call-out boxes are used to discuss how to engage with consultants, an often important, but under-referenced member of an open space management team. Examples include: 1) how to effectively interview them to ascertain if their skills and expertise align with community needs and local conditions, 2) the potential roles they should play, and 3) how to contract with consultants as part of a community's open space management process.

Checklist: Question to Ask During an RFP Interview

The following set of questions may be used during the interview process to assess a prospective consultant's competence, experience, and fit with a community's unique local needs and conditions. The questions are not meant to be exhaustive, and community officials may have other issues they want to address. Rather, this checklist is intended to provide a starting point for ongoing conversations as community officials contract various open space management activities.

□ Q1. Describe your firm's knowledge of and experience with key open space management tasks. Specific areas to describe should include: 1) community assessment, 2) site design, 3) land planning and programming, 4) participatory planning techniques (to include how residents and other organizations are engaged and how their input is incorporated into the design process throughout the life of the project), 5) preparing construction documents, 6) overall project implementation and management (including the identification of funding, technical assistance, and supportive policies to implement and maintain project designs), and 7) site maintenance.

□ Q2. Describe your firm's knowledge of and experience with creating and implementing an open space management strategy that complies with FEMA, state, and local buyout rules and regulations (see Call-Out Box: Legal Aspects of Open Space Management for specific compliance issues to discuss with the consultant, including their knowledge of and experience with these items).

□ Q3. Describe your firm's knowledge of and experience with creating and implementing an open space management strategy in the surrounding area, to include your understanding of local plants and ecosystems, soil types, drainage, local and state regulations tied to buyout lands, and any other factors you think are relevant.

□ Q4. Describe your firm's knowledge of and experience with working in a community of our size and governmental capacity. If your firm has not worked with a similar community, please

discuss the relevant local factors and conditions you would address to help inform an open space management strategy that is appropriate for our community.

- □ Q5. Describe your firm's approach to co-creating the local knowledge needed to successfully develop, implement, and maintain the open space management program. This should include how you will work with not only local officials, but also residents to glean relevant information.

- □ Q6. Provide at least one recommendation from a former client you have worked with on open space management activities. If possible, reach out to other cities or towns in your state or region who have been through a buyout to see if they have contracted out open space management services and whether they were satisfied with their consultant(s).

- □ Q7. Describe how your firm would develop an open space management strategy that requires limited maintenance. This question may be relevant for smaller communities and those with limited resources to maintain the open space over time. Issues worthy of discussion include how the design accounts for the maintenance of walkways, playground equipment, ball fields, and other public infrastructure; connectivity of the open space maintenance strategy to local departmental capacities; type of drainage infrastructure proposed (and its associated maintenance requirements); mowing schedules; and plant selection, including their ongoing maintenance requirements.

- □ Q8. Describe how your firm will assist our community build the local capacity required to assess not only the long-term maintenance of the site, but also the capacity to develop and implement an open space management strategy on our own in the future.

- □ Q9. Describe how your firm would design, implement, and maintain an open space management strategy that includes the conversion of the land back to its natural state. Relevant topics to discuss may include the firm's familiarity with and application of wetlands restoration techniques, xeriscaping, and the use of native plant species appropriate for the site, to include how the firm would address the presence of exotic species, their removal, and the steps taken to limit their return. An additional question may include how the firm proposes to work with local community organizations like garden clubs, as well as agriculture extension agents, to assume some of the required maintenance activities tied to the suggested approach.

- □ Q10. Provide examples of your firm's past work, to include site design drawings, cost estimation procedures, participatory planning processes, and other activities you think are important (see Call-Out Box: Contracting Consulting Services Across the Open Space Management Process for a comprehensive list of activities and the Checklist: Cost Estimating Open Space Management Actions).

- □ Q11. Discuss how your firm's open space management work has assessed a community's needs, including how you have addressed environmental justice as part of this process. A firm's commitment to understanding the physical, social, economic, and ecological conditions of a site and how this knowledge should inform design options is critically important. Most design firms are comfortable addressing the physical and ecological conditions. Firms that can situate these conditions in the existing social-economic setting, including issues tied to equity, inclusion, and empowerment represent the type of partner a local government should consider. See the Detroit, MI case study, which focuses on how an environmental justice lens can be applied to open space management issues.

Image 1. Commemorative public art, New Orleans, Louisiana. *Image: Gavin Smith.*

Image 2. Open space management in Windsor, North Carolina. Following Hurricane Floyd, community officials created canoe camping sites adjacent to what was once a residential neighborhood. *Image: Gavin Smith.*

Tip: *Use of Consultants*

Communities often rely on consulting services throughout the open space management process. Activities undertaken by consultants may include the demolition and clearing of housing and associated infrastructure, grading of the site, developing land programming options, creating an open space site design and construction plan, and implementing that plan. Since FEMA does not pay for the costs associated with open space management activities (other than housing demolition, site clearance, and grass seeding), this means that local governments must identify the funding needed to contract with one or more firms to undertake the activities described in this guide unless they choose to do some or all the work in-house to include working with other members of their open space management team.

Community officials should determine key roles for consultants, local officials, and other members of the open space management team (see Call-Out Box: Creating an Open Space Management Team) to include ensuring that local officials maintain control of the overall process. Disciplinary expertise among consulting firms may include, but is not necessarily limited to, landscape architecture, land use planning, and engineering, as well as a sound knowledge of eligible uses of FEMA-funded buyout property. Assessing the expertise and experience of prospective firms and where they best fit within the larger open space management team is an important role for local government officials.

Image 3. Riverfront park in Grand Forks, North Dakota. This community buyout project followed the 1993 Red River floods and includes a greenway, with a commemorative marker that depicts varied flood heights sustained following a series of historic flood events. See Grand Forks, ND case study for more information. *Image: Erica LaMarca.*

DETROIT, MICHIGAN

CATEGORY: Community Assessment
SUBCATEGORY: Environmental Justice

Introduction:

Detroit, MI has lost approximately 61% of its residents since 1950 due to decades of disinvestment, tax and foreclosure policies, and most recently the Great Recession and the city's bankruptcy in 2013. The socioeconomic crisis has resulted in thousands of vacant parcels and abandoned properties that have become areas prone to crime and further disinvestment.

In 2014, Detroit began a demolition program supported by federal money from the Hardest Hit Fund. To date, the program has demolished more than 20,000 houses.

Parcels are available for purchase by individuals, community organizations, and developers. The Detroit Land Bank Authority maintains approximately 25% of the city's residential properties. While this is not representative of a FEMA buyout, the lessons can be applied to communities that participate in the acquisition of hazard-prone housing, including issues surrounding environmental justice.

Residential properties adjacent to Marathon Oil Refinery. *Image: Detroit Free Press.*

Vacant properties identified for use as green infrastructure. *Image: City of Detroit.*

Case Study Focus:
Environmental Justice

While many of the vacant parcels are being redeveloped to their former use, some community members and groups like Detroit Future City are seeking to maintain the vacant parcels as open space in order to serve community needs. As part of a larger plan, these open spaces will act as buffers for land adjacent to heavy industrial facilities and expressways, passive recreation areas within neighborhoods, space for urban agriculture, and locations to site green infrastructure to manage urban stormwater.

Due to a history of heavy industry in some parts of Detroit, the housing acquisition plan emphasizes environmental justice. Many of Detroit's highways cut through residential areas and older industrial plants are often located next to residential properties. This proximity results in a high level of air pollutants that negatively impact residents' health. Detroit Future Cities proposes using vacant land to serve as a buffer that would absorb pollutants, thereby protecting nearby residents. Additionally, companies like Marathon are working on buyouts and the use of vacant properties as part of a plan to create a vegetative buffer between their refinery and residential homes.

Land development practices in Detroit have eliminated most natural stormwater management systems including wetlands, small streams, and vegetated cover. During heavy rain events, Detroit's sewer system discharges directly into the Detroit River. To protect the Great Lakes, the largest freshwater system in the world from further pollution, more green infrastructure is proposed. Detroit Future Cities proposes that vacant parcels should be assembled into larger contiguous areas of vegetative cover to provide stormwater services as well as a habitat for wildlife. Installation of native vegetation is relatively inexpensive and provides an amenity for the community. The city has already implemented green infrastructure on vacant parcels in neighborhoods like Cody Rouge. This project was led by the Detroit Water and Sewerage Department in collaboration with other city departments.

Beyond repairing environmental damage, Detroit Future Cities proposes that vacant land be used productively. Examples include urban agriculture and the siting of renewable energy sources like solar panels. These projects have the potential to provide important access to fresh food and affordable energy to the surrounding residents.

Key Takeaways:

- *Open space management can address a community's environmental justice concerns.*
- *Community non-profit organizations can help define open space management planning goals.*
- *Buyout properties can serve as an important part of a larger urban stormwater management program.*
- *Collective ownership of resources on buyout parcels benefits residents.*
- *Land banks can serve as partners for open space management and lessen the administrative burden on municipalities.*

Call-Out Box: Contracting Consulting Services Across the Open Space Management Process

In this call-out box, contracting activities are described, including the actions spanning the open space management process. Each of the three tasks in the open space management process (Land Planning, Site Design, and Implementation), as well as their components and subcomponents are described in the context of a hypothetical request for proposals. Case studies that focus on each of the three tasks are parenthetically referenced. It is important to note that some or all of the components described can be undertaken by a local unit of government should they identify the resources needed to do so.

Land Planning

Land planning involves the collection and analysis of key contextual information used to inform the overall open space management process, including site design and implementation. For more detail, see Lumberton, NC, Snohomish County, WA, and Grand Forks, ND case studies.

Component: Request for Proposals

A Request for Proposal (RFP) is often created in response to either regulatory compliance needs like updates to local hazard mitigation plans or as part of voluntary aspirations like the development of an open space management strategy. While there are several options available for selecting consultants to assist with a community's regulatory compliance needs, the role of RFPs in addressing voluntary needs may not be as well defined, and as a result, it is important to clearly articulate specific needs and anticipated outcomes, so that respondents to the RFP understand what is expected of them. For instance, a community may be interested in the inclusion of nature-based solutions in their open space management strategy or assessing losses avoided (See Tips: Procurement Guide for Nature Based Solutions and Assessing Losses Avoided Following Buyouts).

If a community is unsure of what these needs may be, officials can begin by reviewing this call-out box and the Checklist: Questions to Ask During a Request for Proposal Interview. Local officials are also encouraged to talk with other jurisdictions that have used consultants to develop and implement open space management strategies on FEMA-funded buyout lands. Ideally, the jurisdictions questioned are representative of communities of similar size and administrative capacity, although important lessons can be gathered by talking with communities that are recognized as leaders in the field.

- **Subcomponent**: *Procurement.* Defining the relationship between community officials and consultant is an important part of the process. "Professional planners usually function in a technical and advisory capacity to decision makers, providing data, defining alternative courses of action, forecasting impacts, and structuring strategies for the implementation of formal plans" (Marsh, 2010).

Component: Community Engagement Strategy

Creating a community engagement strategy is critical to ensuring that stakeholder concerns and ideas are heard, understood, and acted upon, to include, but not limited to, previous owners of buyout lands, nearby residents who remain, and adjacent communities. Providing opportunities for meaningful discourse between community members and planners can produce contextually specific information that would otherwise not be available to inform the planning process and help to foster a dialogue between members of a community about how projects may impact individuals, neighborhoods, and the larger jurisdiction. Seeking input from members of the community can also help to uncover the values of a place and this information is vital to the overall design process.

Image 4. Pocket park in coastal Mississippi following Hurricane Katrina. This image represent actions taken by coastal towns to repurpose lands where homes once stood using resources other than those associated with FEMA buyout funds. *Image: Gavin Smith.*

The methods used to capture this information should be contextualized regarding community size; administrative, technical, and fiscal capacity; cultural norms; and access to data and analytical tools like Geographic Information Systems (GIS). While every project should assess the appropriate balance of "intake" (extracting information from stakeholders for analysis) versus "dissemination" (sharing information back to stakeholders), the most effective community engagement strategies involve multiple iterations and the use of varied methods to ensure that the input of multiple audiences have been captured and used to inform the planning process and associated design outcomes. Ultimately, community engagement strives for goals guided by community values, plans-of-action, and an overall vision that can inform more detailed designs.

Component: Planning Services

Planning services include assessing relevant contextual factors, conducting an analysis of the land's suitability for varied open space design options, developing differing land use options, creating implementation strategies, and identifying funding to carry out these ideas.

- **Subcomponent:** *Contextual Assessment.* Contextual assessments include background research that examines past and existing site characteristics, plans, policies, and projects to familiarize those involved in the development of the open space management strategy with the range of past and current conditions that help define a community. This is important because it establishes a baseline inventory of data and themes that can guide the direction of further analysis. Understanding the historical context of the site may include cultural as well as physical and ecological conditions. Understood relative to open space, items worthy of study include the cultural history of the homes and land acquired (this information can be used to inform contextually sensitive design options tied to memorialization, social justice, ecological restoration, and other issues as identified). Physical elements may include topography, soils, hydrology, climate, vegetation, habitat, existing infrastructure (e.g., stormwater, roads, water, sewer, and power systems) and nearby public facilities like parks, greenways, and schools. These items are documented and used to inform potential open space design options.

When considering buyout properties, regulations prohibit certain land uses and built improvements on these parcels as defined by FEMA regulations (see Call-Out Box: Legal Aspects of Open Space Management). Local officials and contractors should familiarize themselves with the specific laws, codes, and best practices to make knowledgeable programmatic recommendations in later phases of the land planning process. Ideally, a prospective consultant should have experience with FEMA buyout rules, especially those tied to eligible open space uses.

- **Subcomponent:** *Land Suitability Analysis*. Assessing how programmatic goals, objectives, and land uses fit with a site's physical, biological, and cultural attributes is a critically important part of the larger planning process (LaGro 2013). Using a GIS-based "overlay" method, existing conditions associated with open space parcels, such as their size, location, and spatial distribution (including their relationship to one another as well as other adjacent and nearby land uses) can be synthesized to identify and communicate opportunities and constraints associated with proposed interventions within and around a site. It is important to note that smaller communities may not have access to GIS, and in this case, it would be incumbent on the consultant, regional planning organization, state officials, or others identified in the open space management team to provide this type of technical assistance. Examples of relevant existing conditions related to buyout parcels may include soil type, location in the floodplain (i.e., floodway, 100 or 500-year, flood fringe), slope of land, and type of vegetative cover. Land suitability analysis should also assess the location of buyout parcels relative to land uses adjacent to or near the buyout site, such as distance to prior buyout land, existing parkland and greenways, roads and other physical infrastructure, housing, public facilities, and schools.

This information should be used to identify spatial patterns and inform possible design options, including how new and existing open space parcels can be connected. An analysis of land suitability often results in the creation of GIS-based maps, diagrams, and written reports.

- **Subcomponent:** *Land Use Options.* Recommendations drawn from the contextual assessment and land suitability analysis guide the creation of alternative land use options that are presented to residents and community officials for review and comment. Introducing multiple alternatives to communities is important because it allows for stakeholders to self-assess and respond to the trade-offs and impacts of various land uses that may affect them. Depending on the results of the background studies, options may include the construction of greenways, community gardens, ballfields, parks, commemorative spaces, water retention areas, a return of the land to its natural state, or other ideas identified by residents and members of the open space management team.

- **Subcomponent:** *Implementation Strategies.* Once land use options are distilled into a package of recommendations, a description of design processes and construction practices is required to effectively communicate implementation strategies. This is a critical component of the planning process because it provides a blueprint for follow-up, including action items required to implement identified recommendations. These recommendations help communities of any capacity to sequence, phase, and procure the resources needed to operationalize the plan.

- **Subcomponent:** *Fundraising*. Before addressing more site-specific recommendations, funding is needed to procure contractual services such as surveying and civil engineering, landscape architecture, and architectural services. Communities may also seek out donated expertise, materials, and labor to carry out certain tasks. In both cases, activities should be coordinated with available funding and other resources provided by the open space management team; created in a way that complies with existing FEMA, state, and local rules and regulations; and organized to ensure the appropriate sequencing of these activities.

Site Design

Site design involves exploring "what goes where" on a site (to include the articulation of conceptual design options) followed by the finalization of a physical design plan that provides the framework needed to inform the construction and implementation of the open space management strategy (LaGro 2013, pp. 251-260). For more detail, see Erie, CO, Charlotte/Mecklenburg County, NC, Oso, WA, and Grand Forks, ND case studies.

Component: Request for Proposals

- **Subcomponent:** *Procurement.* There are various formats for designing and constructing projects that should be clearly communicated in any advertised Request for Proposal (RFP). For instance, smaller-scale projects may be suitable for a "design-build" contract, where a general contractor or licensed professional is responsible for submitting drawings and constructing the project within a predetermined budget. However, larger projects are typically more complex and require a series of contracts under a "design-bid-build" approach. In this case, multiple consultants may be engaged in developing a comprehensive set of construction drawings to determine probable costs and bids before beginning construction activities. Typically, the contractor selected for building the project is not associated with the design and engineering consultants who are responsible for creating the construction drawings. Budget, timeline, project scope, and availability of services are all factors that may influence which type of contract(s) are deemed most appropriate for inclusion within a site design RFP (see Call-Out Box: Cost Estimating Open Space Management Actions).

Component: Community Engagement Strategy

Decisions about site selection and community value statements are often resolved before starting the site design processes. However, during the development of the site design, community stakeholders should review and comment on schematic design proposals. These proposals are more clearly defined and visualized than those created during the planning phases. Once site design drawings are more detailed (e.g., construction documents), public announcements can inform community stakeholders about project updates. Communication about the project should reflect local conditions like the demographic makeup of the community (i.e., age, percentage of children in the area, socioeconomic status) and include neighborhoods in proximity to the buyout site. Various media should be used to share this information, including the internet, television, radio, and public meetings (held at differing times to account for various work schedules).

Component: Design Services

- **Subcomponent:** *Advanced Planning.* During this pre-design phase of work, parameters are established for budget, schedule, program, scopes of work, necessary approvals, and site conditions pertinent to the project (Design Workshop 2016). These parameters must be mutually agreed upon by both the client (e.g., elected officials) and the service provider (e.g., consultant). Establishing consensus surrounding the project's scope is typically determined by conducting site visits, performing interviews, and drafting work plans based on input from both parties.

- **Subcomponent:** *Schematic Design.* Schematic Design (SD) includes a series of drawings that explore physical and programmatic attributes of a project. Preliminary designs are developed by combining the project's programmatic needs, community goals, and site suitability through an iterative process led by the designer (LaGro 2013). The primary objective of the SD phase is to create a design scheme that is suitable, feasible, and responsive to client expectations. The SD should also reflect site and contextual conditions (present and future), including long-term management considerations.

- **Subcomponent:** *Design Development.* The purpose of the Design Development (DD) phase is to further develop and resolve all design decisions presented during the SD phase. During DD, it is necessary to "give individual attention to each system, each space, each component, and each detail of the project" (Design Workshop 2016). As the DD phase concludes, the proposal should be well-coordinated with other consultants, mindful of budget constraints, and perform as intended.
- **Subcomponent:** *Construction Documentation.* "Construction documents are graphic and verbal instructions to a contractor for the purpose of bidding and constructing a proposed design" (Harris and Dines 1998). Serving as the implementation contract, the product resulting from the Construction Documentation (CD) phase is meant to inform, with a high degree of precision, all specifications.

Component: Permitting

Adaptive reuse of open space often requires review and approval through the local permitting process. Permit review ensures that constructed improvements comply with codes and ordinances that protect the public's health, safety, and welfare as well as comply with FEMA, state, and local rules and regulations. For instance, items requiring review include assessing the structural integrity of open-air structures, adherence with local building codes, compliance with a community's Local Flood Damage Prevention Ordinance and FEMA's regulations regarding compatible uses, the upstream and downstream impacts of stormwater management projects, and the placement of improvements within buyout parcel boundaries.

Implementation

The implementation of an open space management strategy involves the construction, administration, monitoring, and long-term maintenance of the buyout site. For more detail, see Dauphin Island, AL; Harris County, TX; and Northfield, VT case studies.

Component: Invitation for Bids

- **Subcomponent:** *Procurement.* In a "design-bid-build" project, a formal bidding process is conducted using a public Invitation for Bids (IFB) which guides the selection protocols for awarding a construction contract. Many municipalities use "lowest qualified bidder" formats to ensure that respondents with the lowest cost of services also have a proven record of acceptable performance and other qualifications based on a project's characteristics. An IFB typically requires proof of certain certifications, project references, licenses, and insurance coverage held by the contractor.

Component: Project Reporting and Fiscal Oversight

Projects include varying types of reporting and fiscal oversight requirements based on the source of funding, project scale and complexity, and timeline for completion. For instance, if an externally awarded grant is supporting the project, the grantor may require that certain reporting and reimbursement protocols are followed that differ from how a town or city tracks projects that are paid for using local funds. Assigning a dedicated person(s) with the requisite administrative authority is important to ensure a project is completed on time, within budget, and in compliance with the rules and regulations specified by the funding entity (see Checklist: Creating an Open Space Management Team). This is particularly important in the case of FEMA-funded buyout parcels as regulatory requirements and reporting standards may differ from local ordinances and land uses described in documents like a parks and recreation plan (see Call-Out Box: Legal Aspects of Open Space Management).

Component: Construction, Administration, and Monitoring

- **Subcomponent:** *Pre-Construction Planning.* After a bid award letter is given to the selected contractor, a series of pre-construction meetings take place to ensure that budgets, timelines, site conditions, and design intent are well understood by all parties involved in the project.

- **Subcomponent:** *Mobilization and Site Preparation.* Significant time and resources may be required to prepare a site for construction. This may include: 1) mobilizing materials, tools, equipment, and storage facilities and placing them on a site; 2) gaining access to utility services (e.g., water, electricity, sewer) required for construction operations; and 3) protecting the site and surrounding areas from any potential harm that may result from construction activities (e.g., erosion control, tree protection, etc.).

- **Subcomponent:** *Demolition, Construction, and Oversight.* During demolition and construction activities, all parties involved in the project are expected to regularly engage in site visits to ensure that desired specifications, performance standards, and compliance measures are maintained. Requests for Information (RFI) are common during the construction of any project when new circumstances are discovered, or if discrepancies between drawings, site conditions, budgets, and timelines require adjustment. Open lines of communication between all parties increases the speed and effectiveness of potential alternative decisions. This may require reaching out to the state agency serving as the FEMA grantee who can provide guidance on issues such as the identification of hazardous materials or archaeological features found on the site that were not initially uncovered and alternative uses of buyout properties that differ from the options originally identified.

- **Subcomponent**: *Final Review and Certification.* During the "close-out" phase of any project, designers, local officials, and contractors are expected to review the built conditions for final approval. Additionally, inspections from local permitting agencies may be required to ensure that built conditions comply with existing plans and relevant codes and standards. In the case of an open space management strategy, care should be taken to ensure compliance with FEMA-eligible activities throughout the entire process, including as part of the final review. Upon approval, the permitting agency may issue a certification that confirms the construction phase as being complete and satisfactory (see Call-Out Box: Legal Aspects of Open Space Management).

Component: Maintenance Planning

- **Subcomponent:** *Funding Identification.* Before developing open space management projects, communities must identify the funding and staffing required to manage the site throughout its expected service life. Municipalities often rely on public funds such as parks and recreation budgets to maintain various types of open spaces. However, external resources may be needed in cases where the expected maintenance needs exceed current financial allowances or personnel capacity. Communities may seek out assistance from their open space management team to help address these issues. In addition to identifying funding sources, members of the open space management team may help maintain community gardens, mow vacant lots, plant select vegetation and maintain landscaping, or remove invasive plant species (see Checklist: Creating an Open Space Management Team for potential partners who may assist with maintenance-related issues).

Component: Closeout and Review

Like the project reporting and fiscal oversight phase, external grant funds that support ongoing maintenance activities will likely require the use of final compliance reports and reimbursement processes. Any reporting and auditing activities will vary on a project-by-project basis depending on the

funding source. In many cases, photographs, written descriptions, and invoices must be collected and submitted to satisfy the grantor and facilitate project tracking.

Component: Delegation of Management and Maintenance Roles

Following the completion of construction activities, parties responsible for performing maintenance activities are key to ensuring a project's long-term success. Management responsibilities pertinent to the adaptive re-use of buyout properties may include, but are not limited to, mowing, trash removal, plant care, and the maintenance and repair of allowable built features like trails, benches, gazebos, observation platforms, water retention areas, and ballfields.

Component: Monitoring

- **Subcomponent:** *Regulatory Compliance.* Certain types of built improvements (e.g., stormwater features and park equipment) may require inspections and ongoing reporting of performance to local, regional, or state agencies on an ongoing basis, including during or immediately following storm events. In addition, FEMA-funded buyout lands are required to be tracked over time and compliance with existing rules monitored and reported back to the state and FEMA regional offices over time. State officials responsible for the initial receipt of FEMA buyout funds (State Hazard Mitigation Officer) can provide additional guidance regarding ongoing reporting requirements (see Call-Out Box: Legal Aspects of Open Space Management).

- **Subcomponent:** *Quality Assurance.* Quality assurance refers to maintaining the integrity of site improvements over time. This step is most critical during the first several years following construction because warranties and other guarantees of quality included in construction and maintenance contracts need to be observed and approved by the client or their representative. Developing a long-term maintenance plan is an important part of a larger open space management strategy and benefits from drawing on the expertise of your open space management team.

Component: Maintenance Services

- **Subcomponent:** *Maintenance of Public Property.* Most cases involving the re-programming of FEMA buyout property include a transfer of ownership from the previous private landowner to the local government after the acquisition of the property is complete. In certain circumstances, local governments may partner with county, state, or federal service providers to assist with long-term maintenance, but this requires that all parties enter into formal partnership agreements (i.e., shared-use agreement), before undertaking maintenance services.

- **Subcomponent:** *Maintenance of Private Property.* While buyout properties are commonly deeded to local governments, sometimes buyout parcels can be transferred to other responsible parties (e.g., land trusts, non-profits). This requires the responsible parties to continue satisfying long-term maintenance agreements. While a private group may assume ownership of the property, the same regulations “stay with the property” regardless of the owner. In other cases, adjacent property owners maintain buyout properties through special lease agreements that follow FEMA-eligible uses like a community garden (see Call-Out Box: Legal Aspects of Open Space Management). The primary benefit of using this ownership mechanism is to transfer the burden of long-term property management to an entity that is willing to assume this responsibility. This type of arrangement may be suitable for smaller jurisdictions with fewer staff or those who have difficulty accessing the financing required to maintain the property over time. In other cases, jurisdictions with more capacity like Harris County, TX and Charlotte / Mecklenburg County, NC also use this approach in certain circumstances. If this approach is taken, local officials will need to monitor compliance among private property owners over the life of the agreement.

Tip: *Procurement Guide for Nature Based Solutions*

An additional reference that may prove useful when developing requests for proposals tied to buyouts and open space management is titled "A Procurement Guide to Nature-Based Solutions." This guide, written by the Nature Conservancy, can be found at: http://nrcsolutions.org/wp-content/uploads/2018/02/NBS_Procurement_Guide.pdf

Tip: *Assessing Losses Avoided Following Buyouts*

As part of a community's monitoring of buyout lands, local governments may choose to assess the "losses avoided" following future flood events by estimating the monetary savings accrued by converting the land to open space before a future flood event occurs. This information can be used to inform residents as well as external funders about the risk reduction benefits of buyouts. Given the technical nature of conducting this assessment, the process may be undertaken by state agencies, FEMA, or consultants. The assessment may be further strengthened by collecting personal testimonials from residents who have participated in a buyout and are willing to discuss how they benefited from the process by moving out of harm's way. A collection of losses avoided studies can be found at: Hazard Mitigation Assistance Loss Avoidance Study Summaries | FEMA.gov.

Call-Out Box: Cost Estimating Open Space Management Actions

Identifying costs associated with developing and caring for public landscapes is essential to decision-making processes regarding the highest and best use(s) of publicly owned open space. This call-out box provides a general discussion of open space management components commonly referred to as "cost estimating" because there are significant and highly variable factors that affect costs. Examples include a project's location, physical size, desired uses, programmatic scope, physiographic and ecological constraints, reliance on municipal staff versus private consulting services, the availability of qualified contractors, fluctuations in material prices and availability, and access to locally and regionally sourced materials. Additional cost variables to consider include the quality of workmanship, overtime, productivity (as measured by the daily output of labor hours), the season of year, weather, local union restrictions, and an owner's special requirements and restrictions (RSMeans 2022).

Differentiating Types of Costs

Public projects are typically funded by a government entity and are intended to be owned and operated by a unit of government to provide a public benefit. The development of these projects is often achieved through local government revenue streams, such as taxes, or through special allocations or awards, like bonds and grants. All projects receiving public funds are subject to the rules and regulations of the local, state, or federal government; and in the case of grant awards, the project is subject to the requirements of the funding agency or grantor (see Call-Out Box: Legal Aspects of Open Space Management).

Most units of government create annual budgets, which include expenses that are associated with running a municipality. Budgets are often separated into different categories, including operating and capital expenses. An operating expense supports the day-to-day functioning of a municipality, while a capital expense supports the creation of an asset such as public infrastructure. When a community is contemplating developing a new piece of public infrastructure (e.g., roads, fire stations, or parklands) or a new public program (e.g., stream restoration, open space management), they typically assess both the short-term costs (capital) and long-term costs (operations and maintenance).

Cost-related factors that affect the long-term success of municipal open space management programs include, but are not limited to:

- Resource allocation.
- Generating the capital to implement improvements and allocating sufficient operating costs to maintain improvements over long time periods.
- Ensuring that saving money on installation (referred to as “Value Engineering (VE),” does not shift the financial burden to operating costs.
- Internal staff capacity and human resource allocations.
- The ability to account for escalation. Escalation is a rise in the price of commodities, goods, or services due to a combination of inflation, supply and demand, and other factors such as environmental compliance and engineering requirements. Factors that affect project escalation costs include inflation, supply and demand, technological changes, and environmental, political, and miscellaneous effects such as the Coronavirus pandemic.
- Accounting for inflation, which is an economic term that “measures how much more expensive a set of goods and services has become over a certain time period, usually a year” (International Monetary Fund, 2022). Inflation results in a reduction of purchasing power, which can have significant negative effects on projects that have long implementation periods.

Recommended Processes and Practices

Land Planning

Jurisdictions that maintain a planning staff may choose to undertake project planning activities as needed, while communities and organizations that lack dedicated planning staff often hire professional consultants to assist with codifying and operationalizing projects. The process of advertising and procuring professional planning services is initiated through a Request for Qualifications (RFQ) or Request of Proposals (RFP) as described in the previous call-out box. The role of the RFQ/RFP process is essential to specifying both the service needs and expected outcomes associated with a project contract. This enables a community or other contributing organization to attract consultants whose qualifications best align with the scope and context of their project(s) (see Checklist: Questions to ask During a Request for Proposal Interview).

Technical planning expertise and services commonly associated with and affecting the cost of community open space projects includes: 1) Contextual Assessment, 2) Land Suitability Analysis, 3) Community Engagement, 4) Land Use Options, 5) Implementation Strategies, and 6) Project Financing.

Special Project Planning Cost Considerations. The following items are conditions and features commonly associated with planning for the adaptive reuse of previously developed parcels into functional open space(s):

- Assessment of benefits, such as ecosystem services, reduced wear-and-tear and improved service-life of gray infrastructure.
- Measurement of risk reduction and losses avoided, (see Tip: Assessing Losses Avoided Following Buyouts).
- Economic development, including support of outdoor recreation and tourism.
- Creation of community amenities like parks and greenways.

Site Design

Technical design expertise and services commonly associated with and affecting the cost of community open space projects includes: 1) Advanced Planning, 2) Community Engagement, 3) Schematic Design, 4) Design Development, 5) Construction Documentation, and 6) Permitting.

Special Site Design Cost Considerations*.* The following items are conditions and features commonly associated with repurposing previously developed parcels into functional public open space(s). Each of these items has unique cost implications based on contextual factors such as project location, scope, scale, and timeline(s):

- Compliance with open space limitations, environmental regulations, local ordinances, and offsite impacts (e.g., runoff, water quality).
- Costs associated with site design and engineering fees.
- Physiographic constraints and amenities, such as protecting wetlands, riparian buffers, steep slopes, and erosive soils.
- Minimizing possible ecological impacts due to site disturbance.

Management and Maintenance

Investing in a good open space management strategy will reduce long-term maintenance costs, including through the identification of partners who are willing to donate services and materials. An additional way to reduce long-term maintenance costs is through the development of ongoing activities that address repairs and other actions proactively before they require more costly attention.

Landscape maintenance involves regular patterns of care that prevent a landscape from deteriorating. Maintenance typically includes a set of standardized tasks that help to sustain a predetermined condition, such as keeping the grass at a certain length, reducing the presence of exotic plant species, or maintaining the natural and beneficial functions of the floodplain. The purpose of maintenance is to mitigate symptoms of landscape decline rather than solve the underlying issue(s). Irrigating lawns in arid climates, for instance, is representative of this type of activity. Common landscape maintenance services include mowing, weeding, pruning, mulching, raking, watering, fertilizing, and animal/insect control. Additional activities may include managing illegal dumping and providing varied types of access to the open space depending on the nature of the lands intended uses (i.e., greenways, ballfields, water retention areas, canoe and kayak put in sites, and environmental education).

The operations, management, and maintenance practices that affect the costs of community open space projects includes: 1) Delegating Roles; 2) Monitoring, 3) Quality Assurance, 4) Maintenance of Public Property, and 5) Maintenance of Private Property.

Special Management and Maintenance Cost Considerations. The following items are conditions and features commonly associated with the ongoing care of public open space(s). Each of these items has unique cost implications based on factors such as quantities and volumes, construction access, and availability of qualified staff and contractors. Examples include:

- Time and labor commitment of municipal staff (employees/local officials), volunteers (community groups, non-profits, etc.), and contracted services.
- Insurance and bonding, if applicable to the project.
- Inventory, removal, or reuse of existing landscape plants.
- Off-site costs (access to site, provision of utilities).
- Equipment use (bushhog, grader, bulldozer, excavator, hand tools).
- Materials (mulch, gravel, sand, plants, fertilizer, lumber, paint).
- Coordinating volunteer time and donated materials and equipment (which may qualify for use as a non-federal match in certain grant applications).
- Maintenance, oversight, and administrative costs.
- Mowing and trail maintenance.
- Equipment maintenance and repairs.
- Security.

Implementation

The procurement and administration processes as well as construction, installation, and monitoring services commonly associated with and affecting the cost of community open space projects includes: 1) Pre-Construction Planning; 2) Mobilization and Site Preparation; 3) Demolition, Construction, and Oversight; 4) Final Review and Certification; 5) Financial Planning; and 6) Closeout and Review.

Special Implementation Cost Considerations. The following items are conditions and features commonly associated with repurposing previously developed parcels into functional public open space(s). Each of these items has unique cost implications based on factors such as quantities, construction access, and availability of qualified contractors. Special implementation and cost considerations include:

- Identification and remediation of potential contaminants (e.g., asbestos, lead, petrochemicals, etc.).
- Infrastructure decommissioning, demolition, removal, or repurposing.
- Street, sidewalks, and signage removal or repurposing (repurposing may involve selective removal and reduction in width of streets to serve as walking paths).
- Assessing grading, drainage, hydrological, and erosion impacts of culverts, ditches, trails, ballfields, retention areas, and others as identified.
- Removal or selective expansion of utilities (active and abandoned).
- Removal or selective expansion of potable water systems (pipes and pump stations).
- Removal or selective expansion of sewer systems (pipes, pump stations, and treatment plants).
- Removal or selective expansion of telecommunications (lines, poles, and switching stations).
- Housing demolition, deconstruction, or relocation (See Call-Out Box: Legal Aspects of Open Space Management and Tip: Information on Housing Deconstruction).
- Tipping fees (fees charged for the disposal of waste at a waste processing facility appropriate for the type of debris generated).
- Permitting and approval costs.
- Insurance and bonding.

Site Management and Maintenance. Although the processes of landscape management and maintenance are closely related, the two terms are not interchangeable. Landscape management describes a more holistic concept than landscape maintenance. Landscape management focuses on the development of landscapes to achieve defined performance goals and standards over long periods of time. Examples of open space management goals include enhancing ecosystem services (e.g., habitats, biodiversity, water quality, etc.), improving aesthetics, reducing natural hazard impacts on the built environment, and enabling recreation and education programs. Effective landscape management plans should be periodically evaluated and modified as necessary to ensure the evolving needs of a landscape are addressed. See the following case studies: 1) Erie CO, which describes site design and management-related actions; 2) Charlotte / Mecklenburg County, NC, which discusses site design and multi-objective planning; 3) Harris County, TX, which discusses site maintenance and complex funding strategies; 4) Tulsa, OK, which describes site management as achieved through creative funding strategies; and 5) Grand Forks, ND, which discusses the integration of land use planning and site design, including the ongoing management of a 2,200 acre greenway.

ERIE, COLORADO

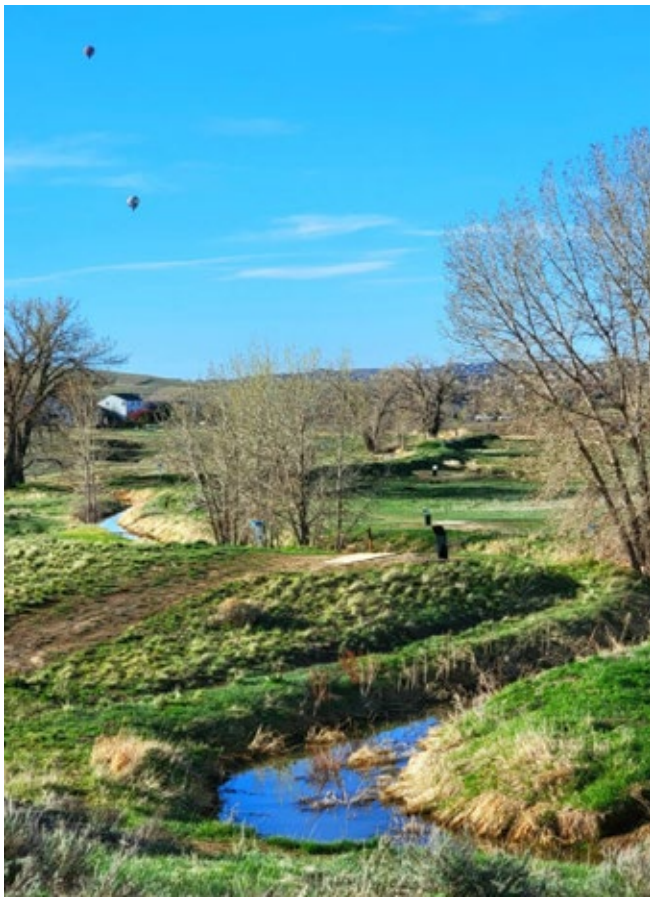
CATEGORY: Site Design

SUBCATEGORY: Environmental Design

INTRODUCTION

The Town of Erie, Colorado is rapidly growing, experiencing a 65% increase in population between 2010 to 2020. This rapid growth has prompted the town to adopt an open space management plan, guided by ecological principles.

The town was severely damaged by flooding along Coal Creek in 1890, 1921, and 1972. After the 1972 flood, a levee was constructed to protect the town from further damage. A flood in 2013 impacted the town, although not as severely as previous events.



Coal Creek Disc Golf Course adjacent to Coal Creek. *Image: Udisc.*

Coal Creek Disc Golf Course. *Image: Co-Hometown Weekly.*

CASE STUDY FOCUS:

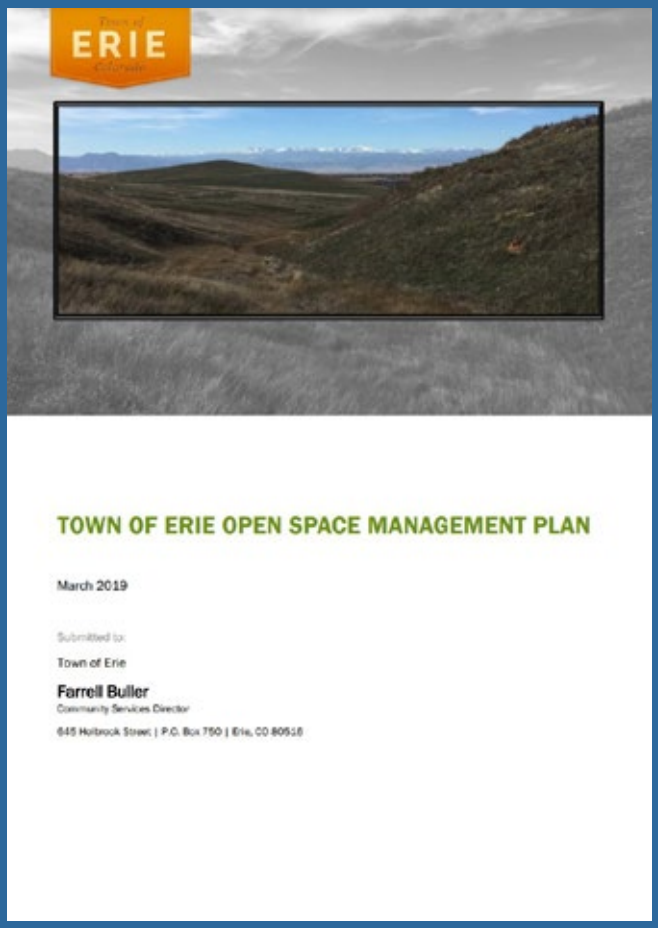
Environmental Design

The Town of Erie has adopted a proactive approach to achieving hazard mitigation and recreational goals by emphasizing open space management. The town has designed a comprehensive guide to aid in managing land that will remain undeveloped and maintained in a natural or agricultural state. While this is not specifically related to a FEMA-funded buyout, the ideas for land maintenance and site design are applicable to properties that have been bought out and cannot be developed due to FEMA regulations.

The Town of Erie has applied environmental design principles to promote hazard mitigation and open space management, thereby reducing future flood risk along Coal Creek. The Town of Erie's Open Space Management Plan depicts several options based on local conditions. For instance, the document notes that large sections of the Coal Creek stream bed are heavily incised and disconnected from the natural floodplain, requiring specific restoration approaches to moderate flood severity.

Because of the potential for flooding, the area adjacent to Coal Creek remains undeveloped. Some of this open space is used as a passive recreation area with walking trails and a disc golf course that opened in 2020. The town collaborated with local disc golfers and Wenk Associates to design the course, which is representative of a low-cost community amenity.

Additionally, Erie has proposed vegetation management on land designated as open space to reduce fire risk and provide erosion control. These ideas are drawn from the Boulder County Wildfire Protection Plan but include information specific to the town of Erie.



Town of Erie Open Space Management Plan.
Image: Town of Erie.

Key Takeaways:

- *Proactive, environmentally focused open space management design is an effective way to protect a rapidly growing community from natural hazards like floods and wildfires.*
- *Appropriately programmed open space land can result in low-maintenance alternatives.*
- *Collaborating with community partners can foster locally-specific options.*

Call-Out Box: Identifying Goals in Community Plans that Align with Open Space Management Strategies

The review of community goals embedded in local plans can help inform the goals developed as part of an open space management strategy like the Erie, CO open space management plan referenced in the prior case study. Relevant community goals may be found in comprehensive land use plans, parks and recreation plans, hazard mitigation plans, and capital improvement plans, among others (See Tips: Aligning Parks and Open space Plans with the Colorado Natural Hazards Risk Prevention Initiative and Assessing Plans Using the Resilience Scorecard). As part of a review of plans, it is important to assess whether the goals found in various plans complement or conflict with goals embedded in a community's open space management strategy, which increases the likelihood of successfully implementing and maintaining the project over time. If proposed open space management goals conflict with the goals found in other plans, and the open space management team thinks the goals found in the open space management strategy are worthy of pursuing, it is beneficial to reach out to the department or individual responsible for the administration of the plan in question and discuss whether changing a particular goal makes sense to better align them.

Taking the time to assess complementary and contradictory goals up front can save time in the long run. The failure to assess potential conflicts may result in the development of contradictory goals or require modifying or eliminating goals previously created in other plans later. This can damage partnerships developed over time and hinder the ability to create and maintain broader coalitions. When acting collectively, an open space management team has greater power and influence over decisions made by elected officials and prospective resource providers. Identifying mutually compatible goals can also broaden the types of resources available, including: 1) technical assistance, 2) policies created and supported by existing networks, and 3) funding sources, whether they are part of a community's operating budget or obtained through external grants.

Tip: *Aligning Parks and Open Space Plans with the Colorado Natural Hazards Risk Reduction Initiative*

For a more detailed description of how parks and open space plans can be aligned with natural hazards risk reduction efforts, see the website Planning for Hazards: Land Use Solutions for Colorado at: https://planningforhazards.com/parks-and-open-space-plan.

Image 5. Signs highlighting disc golf course and boat launch on and adjacent to buyout lands in Windsor, North Carolina. *Image: Gavin Smith.*

Tip: *Assessing Plans Using the Resilience Scorecard*

Communities may review the degree to which the collection or "network" of plans found in communities advance (or hinder) resilience using the Resilience Scorecard. For more information about the Resilience Scorecard, see: https://planning-org-uploaded-media.s3.amazonaws.com/publication/download_pdf/PAS-MEMO-2021-01-02.pdf.

CHARLOTTE, NORTH CAROLINA

CATEGORY: Site Design

SUBCATEGORY: Multi-Objective Planning

Introduction

Charlotte is North Carolina's largest city, comprised of approximately 857,000 residents. Severe flood damage from Tropical Storm Jerry in 1995 and Hurricane Danny in 1997, led Mecklenburg County to initiate a large-scale floodplain buyout program as localized, albeit severe flooding did not merit a federal disaster declaration and the associated FEMA hazard mitigation funding that is triggered by such an event. This locally funded buyout program is run by the Charlotte-Mecklenburg Stormwater Services (CMSS). To date, the program has acquired 700 households, resulting in the creation of 185 acres of recreational open space. In addition to the use of local funds, CMSS has partnered with the North Carolina Division of Emergency Management to obtain HMGP funds to acquire additional flood-prone housing.

One example of the program's success is found in the Chantilly neighborhood. Two of the large housing complexes in this neighborhood, including Cavalier Apartments and Doral Apartments, sustained damage five times in the span of two decades. The Cavalier Apartments, including 13 acres and 192 apartment units, were purchased by the city in 2008 and torn down in 2009. Half of the Doral Apartments, including 8.4 acres of land and 128 apartment units were purchased in 2010 and torn down in 2011. Before the demolition began, the local Habitat for Humanity helped remove reusable items from the apartment units, while asphalt, brick, concrete, carpets, and metal products were recycled.

Flooding in the Chantilly Neighborhood, 2007.
Image: Wildlands Engineering, Inc.

"Eventually, by around 2023, the greenway system will come through this area, giving pedestrians even more to look forward to on their walks. We took a lot of input from Chantilly Montessori School and wanted to provide them with learning opportunities as well. The hope is that eventually this will be incorporated into a neighborhood park."

Crystal Taylor,
CMSS Project Manager quoted in The Charlotte Observer, 2019.

Case Study Focus:

Multi-Objective Planning

The 24 acres of land resulting from the buyouts have been transformed into the Chantilly Ecological Sanctuary. The ecological restoration project cost approximately $4.9 million to build. The Charlotte-Mecklenburg Storm Water Fees contributed $4.8 million and the 319 grants from the NC Department of Environment & Natural Resources contributed $100,000.

This project provides a good example of how sound urban floodplain management can achieve multiple objectives through the restoration of Briar Creek, Edwards Branch, and the Chantilly Tributary. In addition to preventing damage from future flood events, the Chantilly Ecological Sanctuary's ponds and wetlands help enhance local water quality, while the entire site provides a place for students at a nearby elementary school to learn about ecosystem restoration. To enhance local biodiversity, the City has partnered with the Butterfly Highway to plant low-maintenance native grasses and flowers that will attract new species to the area.

Chantilly Ecological Sanctuary at Briar Creek. *Image: City of Charlotte.*

Key Takeaways:

- *Buyout properties provide an opportunity to reuse and recycle materials with the help of local partners like Habitat for Humanity.*
- *Well-planned open space management strategies can achieve multiple objectives, including improved water quality, flood risk reduction, environmental education, and ecological restoration.*
- *The use of local stormwater management fees to purchase hazard-prone housing allows local governments to create eligibility criteria that reflects local conditions.*

HARRIS COUNTY, TEXAS

CATEGORY: Implementation

SUBCATEGORY: Conveying Complex Funding Structure

Introduction

Harris County, TX, has a long history of flooding, due in part to it's original settlement at the confluence of Buffalo Bayou and White Oak River. Over time Houston, the county's largest city, has sprawled outwards, covering much of the metropolitan area with impervious surfaces and altering natural drainage systems. In 2001, Tropical Storm Allison resulted in 73,000 damaged residences and over $5 billion in property losses (Harris County Flood Control District, 2022). In 2008, Hurricane Ike caused more significant damage in Harris County to include 2,400 injuries and 11 fatalities. Nearly a decade later, Hurricane Harvey (2017) caused $125 billion in damages and 36 fatalities.

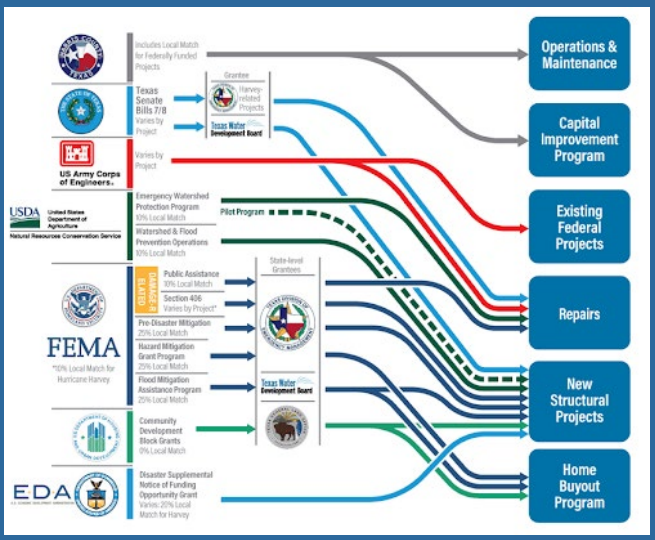
These storms acted as catalysts to motivate action among governmental officials. The government used multiple funding streams, including Harris County Flood Control District (HCFCD) revenue to purchase 512 properties, with 3600 homes slated for acquisition (Peterson et al. 2020). The HCFCD is a special purpose district created by the Texas Legislature in 1937. It is governed by the Harris County Commissioners Court, which oversees structural, non-structural, and infrastructure management projects. Beyond managing diverse funding strategies, HCFCD provides mapping, programming, training, and public engagement activities focused on advancing disaster resilience. This information is accessible via the HCFCD's website that offers constituents the opportunity to focus their search on changes affecting their neighborhood's watershed. The website includes interactive tools to explain these processes and their importance to the public. These resources are made available in French, Spanish, Vietnamese, and Chinese to increase their accessibility. Web pages are dedicated to each watershed within the county with details regarding that community's environmental status and projects that pertain to them.

The Gaining Greenspace map shows where Harris County is making investments in open space on land acquired for flood mitigation purposes. *Image: Community Impact Newspaper.*

Case Study Focus:

Conveying Complex Funding Structure

Even though Harris County has continued to take the initiative through the HCFCD and various flood damage reduction projects, there is still significant work to be done. The success of these projects is dependent on clear and open communication between government officials and the residents of Harris County. Harris County voters approved a $2.5 billion Green Bond Program in 2018 after Hurricane Harvey flooded over 200,000 homes and apartments. Harris County plans to purchase approximately 900 properties and use $59 million in bond money to leverage $159 million from the HMGP. In the November 2022 election, 68% of voters approved a referendum to provide $166 million to fund parks, while $100 million will be dedicated to the continuation of the Bayou Greenway project.



A diagram illustrating the variety of funding streams available for hazard mitigation and adaptation efforts. *Image: Harris County Flood Control District.*

The greenway projects provide one example of how the government uses open space management to reduce flood damage. Harris County also purchases properties in the floodplain before they can be developed to prevent more people from moving into vulnerable areas (Knipp 2018).

As the county continues to invest in parkland it is also striving to address inequalities in access to green space. For example, in 2018 the Houston Endowment and Precinct 1 worked together, drawing from a $549,000 budget, to study accessibility to local parks. As a result of these efforts, Houston has been steadily climbing up the ranks of the Trust for Public Lands (TPL) annual park score. While improving, Houston is currently ranked at #70 out of 100 on the TPL annual park score. According to the TPL's analysis, Houston has a park equity score of 43 out of 100 (TPL, n.d.).

The Houston Parks Board accepts private donations in addition to public funding. One public-private partnership project of note is the Bayou Greenway which began in 2012. The goal of this plan is to connect all bayous within Harris County via hike and bike trails. It will cover 3,000 acres and 167 miles of trails spanning nine bayous. Additionally, this initiative runs through Precinct 1 in Houston, an area of town that has seen historic underinvestment.

Key Takeaways:

- *Complicated systems require clear graphic communication and transparency to keep residents informed and engaged.*
- *Public and private partnerships can improve park access equity.*
- *Education and engagement can lead to residents approving the utilization of local funding sources to support open space management initiatives.*

TULSA, OKLAHOMA

CATEGORY: Maintenance

SUBCATEGORY: Creative Funding Strategies

Introduction

Tulsa is located along the Arkansas River and is traversed by more than 30 smaller creeks. Throughout the 1970s and 1980s, the city experienced several damaging floods, including three federally declared flood disasters in 1974. Citizens affected by the floods claimed that Tulsa officials were not enforcing NFIP regulations while promoting unchecked development. This led to a growing tension between the public and the city's developers and builders. The dispute was so contentious that local media outlets called it the "Great Drainage War."

After a flood in 1984 that left 14 people dead and caused $292 million in damage, the city took several actions to address its flooding issues. In addition to embarking on a large-scale buyout of flood-prone properties, the city developed building code and floodplain management standards and a zoning ordinance that exceeds national requirements.

Greenway created from buyout parcels in Tulsa.
Image: CRS website.

To help fund Tulsa's mitigation strategies, the city implemented a Local Option Sales Tax in 1986. Tax funds support the 25% cost match for hazard mitigation measures required for HMGP projects and the purchase of properties using local resources.

Case Study Focus:

Creative Funding Strategies

After the 1984 flood, Tulsa established the Department of Stormwater Management to focus on improving flood control and drainage. Tulsa charges residential, commercial, multi-family, and industrial property owners a Stormwater Utility Fee as well as a flat Local Option Sales Tax. These taxes are managed by the City of Tulsa Engineering Services-Flood Control. As of 2020, citizens were paying $8.35 per month for their stormwater utilities. Tulsa residents who maintain flood insurance can offset the costs associated with the utility fee and sales tax through deductions on their flood insurance premiums because of Tulsa's participation in the CRS program.

A bond program, also established in 1986 after the 1984 flood, has been used in tandem with the Local Option Sales Tax to fund buyout projects. The locally funded buyout preceded the HMGP, which was created by FEMA in 1988. Taken together, the taxes and bond efforts have resulted in $1,300,000 in city revenue to support the acquisition of flood-prone properties. The voluntary buyout program has removed 900 homes from the floodplain since 1984, leading to the development of an extensive greenway system and large public spaces.

The city of Tulsa's Comprehensive Plan and 2019 Hazard Mitigation Plan include a number of green infrastructure and recreational projects. These include flood bypasses, waterfront parks, greenways, sports fields designed to serve as water detention areas, and floodplain restoration. Crucial to Tulsa's success was the creation and implementation of a Master Drainage Plan and the establishment of a department that manages flood mitigation. The city's stormwater utility fee provides for the regular maintenance of Tulsa's array of open space programming.

Gaining the public's approval of these funding initiatives and strict codes was initially challenging. Tulsa led a comprehensive education program to work with citizens to help them understand the urgent need for improved floodplain management. Since the inception of these actions in 1987, Tulsa has not seen significant property damage caused by flooding while maintaining economic growth in urban areas. This proactive approach to open space management has resulted in the city obtaining a CRS rating of 1, which allows residents to enjoy a 45% discount on their flood insurance premiums.

	Project Title	Requesting Dept	Cost Estimate (in $000)	Estimated Annual Operating Impact
1	CW - Bridge and Culvert Replacements	Flood Control	$ 10,447,500	$ 10,000
2	CW - Channel Erosion and Stabilization	Flood Control	$ 17,000,000	$ 10,000
3	CW - Comp Study of Stormsewer Collections	Flood Control	$ 3,000,000	$ -
4	CW - Concrete Channel Rehabilitation	Flood Control	$ 12,750,000	$ 10,000
5	CW - Flood Control Engineering & Inspection	Flood Control	$ 500,000	$ -
6	CW - Floodplain Acquisition	Flood Control	$ 14,000,000	$ -
7	CW - Hydrologic & Hydraulic Modeling	Flood Control	$ 6,000,000	$ -
8	CW - Master Drainage Plan	Flood Control	$ 16,000,000	$ -
9	CW - Planning Services for Hazard Mitigation	Flood Control	$ 250,000	$ -
10	CW - Urban Lake Maintenance	Flood Control	$ 2,500,000	$ 10,000
11	CW - Urgent Small Drainage Projects	Flood Control	$ 8,500,000	$ 10,000
12	CW - Stormwater Facility Repair and Construction	Flood Control	$ 8,235,000	$ -
13	CW - Flood Control	Flood Control	$ 359,859,087	$ 457,000
		TOTAL $	**459,041,587**	**$ 507,000**

Screenshot of some of the projects and costs associated with Tulsa's Stormwater Management Program.
Image: Tulsa Master Plan Priorities, Section 7.

Key Takeaways:

- *Creating local funding sources for buyouts provides a community with flexible resources to address local needs and conditions.*
- *Disasters can lead to significant policy change, including the creation of a comprehensive open space management strategy.*
- *Garnering political buy-in can foster proactive open space management land programming, including that supported with internal and external funding.*

Call-Out Box: Legal Aspects of Open Space Management

Federal, state, and local rules, laws, and policies tied to the maintenance of open space following FEMA-funded buyouts are discussed below. For more information on compatible and incompatible land uses see, 44 Code of Federal Regulations (C.F.R.) §80.19(a).

Open Space Management Reporting

Every three years, state and local officials who receive FEMA buyout funding must submit a report to their FEMA Regional Administrator (FEMA is comprised of ten geographically delineated regions spanning the continental U.S. and territories). The report must certify that the acquired property was inspected within the preceding month and that the property has been maintained in accordance with deed restrictions and grant award requirements.

Allowable Uses

Properties acquired using FEMA funds are subject to strict limitations on development. The FEMA regulations, found at 44 C.F.R. §80.19(a), provide examples of activities that are compatible and incompatible with this requirement. Compliance with land purchased using FEMA funds requires adopting appropriate deed restrictions. An example of a model deed restriction can be found at: https://www.fema.gov/sites/default/files/2020-08/fema_model-deed-restriction.pdf.

Title, Easements, and Land Use Changes

Buyout properties must be acquired with clear title (44 C.F.R. §80.17(b)). Any easements or other encumbrances to the property that are incompatible with open space requirements must be removed before acquisition can occur (44 C.F.R. §80.17(b)). After the acquisition, FEMA must approve any land use changes to ensure the proposed use is compatible with open space requirements. This includes FEMA approval for changes to leases or encumbrances before the local government leases the property to a private individual or entity. FEMA, the State Hazard Mitigation Officer (SHMO), and local government officials are required to enforce compliance with open space restrictions (44 C.F.R. §80.19(e)). See the link to the Code of Federal Regulations regarding property acquisition and open space management at:https://www.ecfr.gov/current/title-44/chapter-I/subchapter-B/part-80.

Transfer of Land Ownership

The following entities may receive title to buyout lands: municipalities or counties and non-profit or community organizations. In most cases, a local unit of government such as a municipality, county or parish agrees to assume the title and associated land ownership responsibilities. A municipality or county/parish may agree to lease buyout land to an individual property owner with the stipulation that it is maintained in accordance with FEMA rules and local regulations. This often occurs in communities where checkerboarded buyout patterns exist (See the Dauphin Island, AL, Snohomish County, WA, and Lumberton, NC case studies). An adjacent property owner may lease buyout land and agree to maintain it, to include mowing and general upkeep. If a non-profit or community organization takes ownership of the buyout property, this requires signing a legal agreement with the municipality or county/parish in which the property is located. While non-profit organizations like land trusts are uniquely qualified to take on these roles and are increasingly engaged in such efforts, several barriers exist that limit their widespread participation (see Call-Out Box: The Potential Role of Land Trusts in Open Space Management).

Liability of open space lands

While most eligible land uses are spelled out in FEMA guidance, the owner of the land should recognize and account for potential liability issues associated with these uses. In most cases, liability concerns rest with the municipality or county/parish in which the land is located. This includes, for instance, maintaining vacant lots in a manner that does not allow for the dumping of trash or potentially harmful objects or chemicals. Open space used for recreational purposes, including parks, greenways, and hiking trails or land suitable for hunting should adhere to local liability laws attached to public property in that jurisdiction. Additional uses that merit the attention of the local attorney may include water retention basins, including the installation of protective measures and signage denoting a water hazard.

Deriving revenue from open space

Revenue can be derived from open space properties if the activities comply with allowable uses and the revenue generating activities support the design, construction, and maintenance of eligible uses on buyout land. Examples of revenue generating activities may include park or recreational facilities use fees, the harvesting and sale of timber and other crops, hunting leases and fees, and garden use fees. Eligible maintenance costs may include the purchase of materials, labor expenses, and overall open space management.

Takings law, condemnation, and acquisition of land adjacent to buyouts

Local jurisdictions have the authority to condemn hazard-prone properties (that are not part of a FEMA-funded buyout), although this remains uncommon due to concerns regarding takings law. Any effort to voluntarily acquire some properties using FEMA funding and condemning others in the same neighborhood is not allowed per FEMA regulations. Questions regarding the buyout of hazard-prone housing using FEMA funding and the condemnation of other properties outside or adjacent to a buyout area using a municipalities police power should be posed in writing to the SHMO and the FEMA regional office in which the jurisdiction resides.

While land acquired using FEMA funding must be obtained voluntarily, research suggests that some property owners do not feel that they have a choice or that their options are limited. Reasons cited for this perception among prospective buyout participants include, 1) the insufficient exchange of information regarding the buyout process such as providing a clear understanding of the funds the property owner will receive at closing and how this amount aligns with their financial capacity to purchase a replacement home of comparable size outside the floodplain; 2) a lack of economically viable alternatives to the buyout offer; and 3) pressure placed on property owners to participate (see Appendix 1: Review of the Open Space Management Literature).

Heirs property

Heirs property is land that is jointly owned by multiple individuals and may be passed down from preceding generations. While joint owners have the right to use the land, no one individual has a clear title. In some cases, property ownership is divided among many individuals, including family members who may have had the land handed down to them from relatives. Buying property held by multiple heirs requires local officials or contractors to track down all property owners to obtain a written agreement that they are willing to sell the property. In the case of larger buyouts, the jurisdiction's attorney may need to seek additional legal assistance to help undertake this time-consuming process.

Demolition and deconstruction of buyout housing

In most cases, once a home is acquired it is demolished and the debris is taken to appropriate disposal facilities depending on the nature of the contents. The presence of asbestos, household chemicals, white goods (appliances), and underground storage tanks may necessitate the remediation of these environmental hazards and the identification of disposal facilities capable of accepting these materials. In other cases, homes may be burned as part of firefighter training, which requires stripping the home of hazardous materials before undertaking such activities.

Homes slated for acquisition and demolition are comprised of many items that may be salvaged depending on their pre-event condition and their exposure to water, fire, wind, or ground motion. For instance, exposure to water may limit the use of materials as this can lead to mold or warping of flooring, joists, beams, framing, and cabinetry. In other cases, homes may be structurally damaged due to lateral loads on buildings associated with high winds, storm surge, rapidly flowing water or ground motion associated with earthquakes. The reuse of these materials should be considered on a case-by-case basis and may merit the involvement of local building code officials, floodplain administrators, public health officials, and structural engineers.

Deconstructed and salvaged materials may be used to construct gazebos, benches, decking, walkways, memorials, or other amenities for use on the buyout site that adheres to FEMA requirements. Salvageable materials may also be donated for reuse in other homes. Materials salvaged from homes may include bricks, dimensional lumber, floor joists, trusses, cabinetry, doors, sinks, bathtubs, windows, light fixtures, and flooring (not damaged by water). Each home necessitates an inspection by a company familiar with varied deconstruction and salvage options in partnership with a local building inspector knowledgeable of local codes and standards regarding the reuse of materials. Depending on the condition of the home, options may include demolition, the “soft stripping” of materials, a hybrid approach, and the full deconstruction of the structure. While the traditional demolition or soft stripping of a home can occur in a day, the hybrid option may require up to three days, whereas a complete deconstruction may require between three to ten days to accomplish (see Tip: Information on Housing Deconstruction).

Maintenance of land and property

An important part of any open space management strategy includes specifying who will be tasked with the ongoing maintenance of the buyout land and associated appurtenances such as playground equipment, trails, water retention areas, and greenways. Identifying the individuals responsible for these activities should be part of a larger effort to create your open space management team as described in the Checklist: Creating an Open Space Management Team.

It is also important to note that land maintenance issues are often legally tied to deed restrictions and easements that specify appropriate uses. In addition, local ordinances should be used to govern issues tied to illegal dumping, general aesthetics, and upkeep, such as mowing, landscaping (including plant selection, fertilization, and pruning); the conversion of land to its natural state, to include use of native plants; harvesting of timber or crops; and noise abatement.

The ability to comply with federal, state, and local legal requirements benefits from including those with this knowledge in an open space management team. Examples include the town or county attorney, land use planner, parks and recreation director, public works director, NFIP Coordinator, emergency manager, grants manager, and others as identified. Investing the time to create a diverse group of individuals with varied types of knowledge, expertise, and experience significantly improves the likelihood of creating and maintaining a sound open space management strategy.

See the following case studies, including: 1) Lumberton, NC, which emphasizes the value of collaborating with university faculty; 2) Dauphin Island, AL, which involves working with a local property owners association; 3) Snohomish, County, WA, who collaborated with the Public Works Department; 4) Northfield, VT, who partnered with a regional planning organization; 5) Linden, NJ, who worked with Rutgers University following Superstorm Sandy; and 6) Grand Forks, ND, who partnered with a number of city and state agencies.

Tip: *Information on Housing Deconstruction*

For more information on deconstruction see "Implementing Deconstruction in Florida: Materials Reuse Issues, Disassembly Techniques, Economics, and Policy" (Kibert and Languell 2013) and "Breaking the Debris Cycle: The Case for Deconstruction" (Holland n.d.), which discusses deconstruction as an alternative to demolition in FEMA-funded buyouts.

Image 6. Deconstruction of home in Lyons, Colorado following buyout. This deconstruction project took place following major flooding along the Saint Vrain River in Lyons, Colorado. *Image: Gavin Smith.*

LUMBERTON, NORTH CAROLINA

CATEGORY: Land Planning

SUBCATEGORY: Assistance from Committed Partners

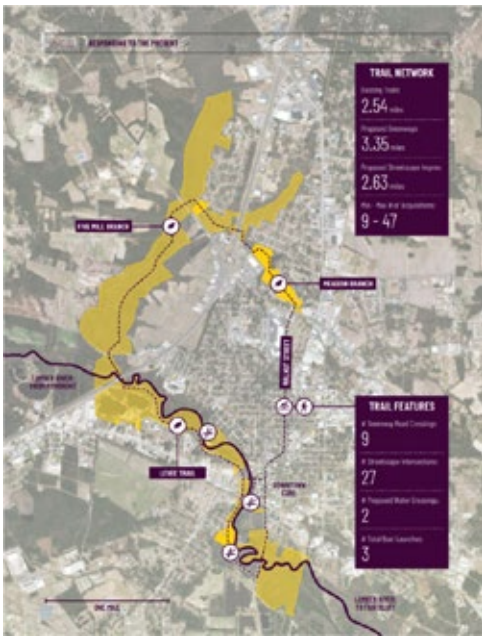
Introduction

Lumberton, NC, a city comprised of 20,928 (2019) people, is located in the state's coastal plain. The City of Lumberton partnered with North Carolina State University's Coastal Dynamics Design Lab (CDDL) following Hurricane Matthew (2016), and has continued this relationship over time.

The CDDL worked in collaboration with city officials and community members to create and implement the Lumberton Community Floodprint: Strategies for Resilient and Usable Open Space. The document includes open space design concepts informed by policy research, hydraulic modeling, vulnerability assessments, land planning analysis, and community engagement. The document also includes potential funding options to help achieve identified goals. Floodprint provides the city with an in-depth analysis of local conditions as well as site-specific recommendations to strategically use its open space to support the city's long-term goals spanning community health, resilience, culture, and economic vitality.

One open space solution proposed as a result of the Floodprint research and engagement process is the Lumberton Loop. This recreational trail connects an 8.52-mile path comprised of 108 properties totalling 806 acres.

The initial buyout funding resulted in a checkerboard pattern. Following a spatial analysis, faculty identified remaining parcels, that if purchased in a second phase of buyouts, would create a continuous path for the proposed Lumberton Loop. Faculty developed an application for the remaining properties as well as an award-winning 1.93 million-dollar, Building Resilient Infrastructure and Communities grant, that will be used to restore stream channels, construct wetlands, reforest floodplains, remove roadways, and create multi-modal paths.



Lumberton Loop Trail System.
Image: NCSU, Coastal Dynamics Design Lab.

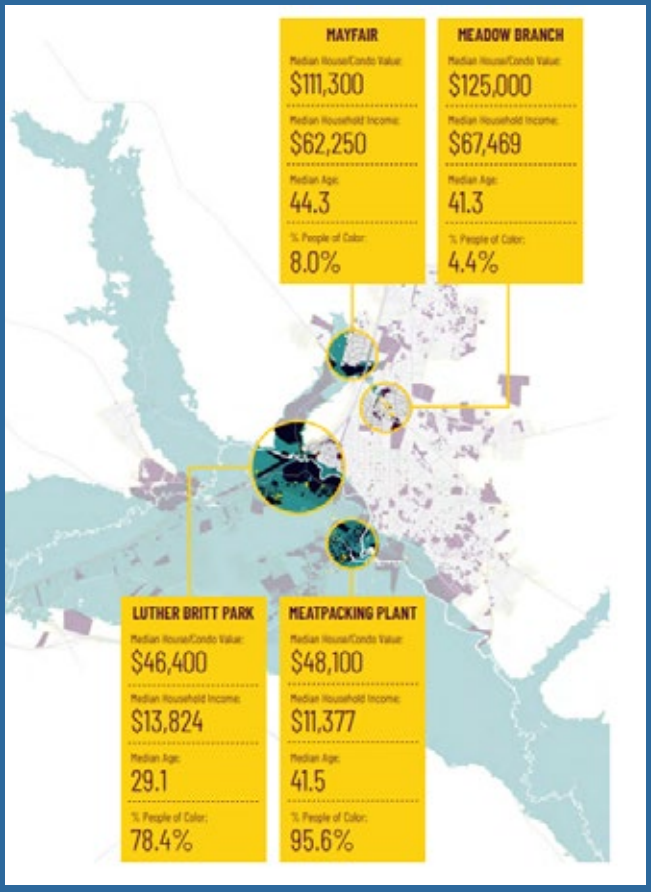
Lumberton Existing Conditions. *Image: NCSU, CDDL.*

Lumberton Proposed Design. *Image: NCSU, CDDL.*

Case Study Focus:
Assistance from Committed Partners

The Lumberton Community Floodprint highlights what can be achieved when communities partner with interdisciplinary design teams, such as the CDDL at North Carolina State University. The design team produced a graphic language that helped to convey the open space management strategy to multiple stakeholders, including potential funding organizations. Key partners include the City of Lumberton, the Conservation Fund, the North Carolina Office of Recovery and Resiliency, the North Carolina Division of Emergency Management, the North Carolina Department of Transportation, North Carolina State Parks, and the Lumber River Conservancy (See Callout Box: The Role of Land Trusts in Open Space Management).

Publications like the Lumberton Floodprint can position towns and communities to understand important underlying conditions, and based on that information, develop conceptual design strategies and identify the resources required to carry them out. The CDDL purposely targets communities that may not have access to the resources needed to perform the research and analysis necessary to apply for needed funding. As a result, the CDDL plays a crucial role in ensuring that innovative open space strategies can be funded and implemented.



The figure shows areas where vacant parcels and existing lands owned by city, state, or conservation groups contain beneficial traits that can be applied in the Floodprint model.
Image: NCSU, Coastal Dynamics Design Lab.

Key Takeaways:

- *Design documents like Floodprint present a holistic approach to community needs assessment, land planning, and implementation.*
- *A long-term partner, like CDDL, can assist an under-resourced community address unique challenges like checkerboarding by identifying strategic parcels, that when purchased with additional grants, provide a continuous set of properties that can be programmed in a manner that serves as a community-wide asset (See Tip: Engaging with Faculty and Extension Agents at Land Grant Universities and Minority Serving Institutions.*

DAUPHIN ISLAND, ALABAMA

CATEGORY: Implementation
SUBCATEGORY: Neighborhood Parks

Introduction

The town of Dauphin Island, Alabama is located on a barrier island in the Gulf of Mexico. The town has been struck by a number of hurricanes and tropical storms, including Hurricane Ivan (2004), which resulted in two feet of standing water covering 25% of the island. Three parcels were acquired with HMGP funds and transformed into two neighborhood parks.

The Mayor of Dauphin Island, Jeff Collier, said of these acquired parcels, "There is no question about what would have happened to these homes during Katrina if they had not been [removed from the floodplain]. They would have flooded." The town's approach to maintaining this land as open space reflects Dauphin Island's ability to achieve both risk reduction and recreational goals.

Case Study Focus

Neighborhood Parks

Pryor Park and Salt Creek Park provide examples of how small-scale buyouts can result in a community asset versus a financial and administrative burden. Because the land must be maintained in perpetuity as open space, it can prove difficult for smaller communities to develop alternatives to the all too common vacant lot. Dauphin Island, with support from residents and the mayor, turned these parcels into neighborhood pocket parks, which discouraged illegal dumping as residents took ownership of the space, to include creating partnerships with community organizations to help fund the park's maintenance. Salt Creek Park is maintained by a partnership between the Town of Dauphin Island and the Dauphin Island Property Owner's Association.

Playground, Salt Creek Parks. *Image: GoogleMaps.*

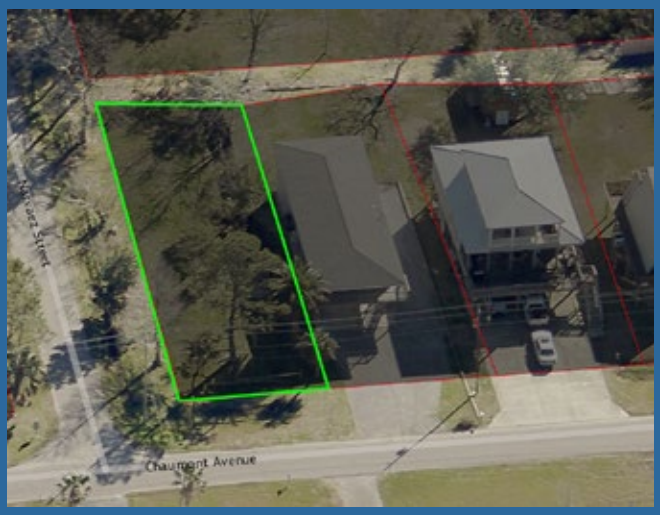
"My grandson had a blast on the playground. This is a very nice park. I recommend it to everyone."

- Review of Salt Creek Park, GoogleMaps.

In Pryor Park, natural landscaping and low-cost programming like benches for bird watching reduce the cost of site maintenance.

The sites are located on former residential lots, making them convenient for community members to use. Salt Creek Park includes a playground, gazebo, and picnic tables. It is also located adjacent to a 7-mile bike trail that traverses the island. Disconnected parcels often lead to checkerboarding but because Dauphin Island used the non-contiguous parcels to site neighborhood parks, the town has been successful in creating a positive perception of the acquired land, leading to greater community support.

Salt Creek Park parcels. *Image: Mobile County.*



Pryor Park parcel. *Image: Mobile County.*

Key Takeaways:

- *A park can improve a community's perception of open space, leading to greater residential investment in its maintenance.*
- *While checkerboarding is not preferable, the use of individual parcels as neighborhood parks benefits community members, and through thoughtful planning, can connect with other systems like greenway trails.*
- *Municipal-community partnerships can assist with open space management in smaller towns with limited resources.*

SNOHOMISH COUNTY, WASHINGTON

CATEGORY: Land Planning

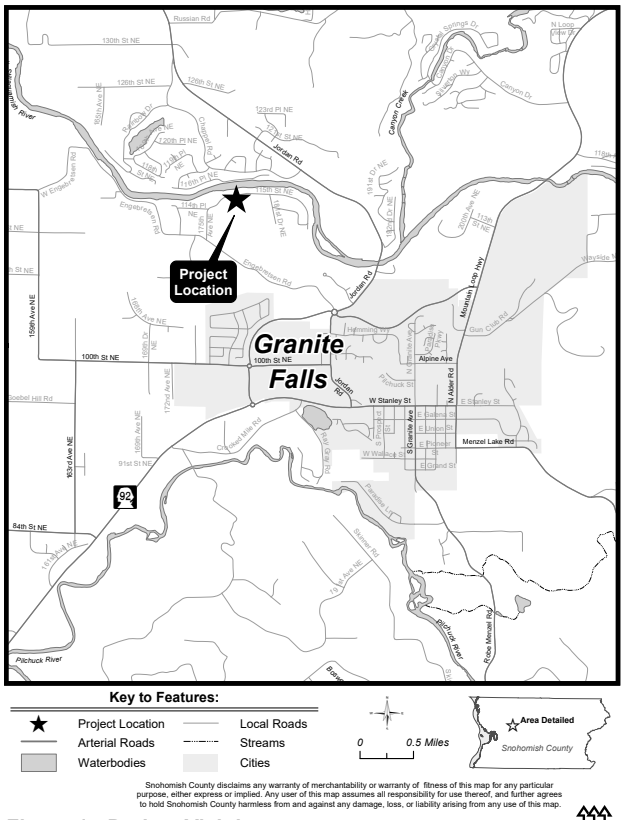
SUBCATEGORY: Ecological Restoration

Introduction

In 2015, the areas around the South Fork of the Stillaguamish River in Snohomish County, Washington experienced significant rainfall and flooding. One of the most severely damaged parcels was situated within the riparian buffer, about 300 feet from the river's ordinary high water mark (OHWM). The 0.3-acre site included the Douglas Showhome (a mobile home), two outbuildings, a septic system, a well, and a driveway.

Snohomish County pursued a buyout of the parcel and was awarded funds from both FEMA and the Washington State Military Department which houses the state's emergency management agency.

When designing the new open space, land use planners followed county-level design codes and standards, including the Snohomish County Drainage and Land Distributing Activity (LDA) code. The maintenance of the resulting open space is being overseen by the Snohomish County Public Works Department in accordance with the Snohomish County Drainage Manual.



Douglas Showhome Site Map. *Image: Snohomish County.*

"Snohomish County Public Works proposes the demolition of structures on a property located approximately 300 feet south of the South Fork Stillaguamish River in the Cedar Lane Estates neighborhood, north of Granite Falls.

FEMA has determined that the mobile home on this property is "Substantially Damaged" due to repeated flooding and has agreed to fund the acquisition of the property. Following acquisition, the mobile home and all other structures will be demolished and removed. The driveway and septic system will be decommissioned.

- Snohomish County

Postcard notice sent to neighbors about buyout taking place. *Source: Snohomish County.*

Case Study Focus:
Ecological Restoration

While comprised of only one parcel, Snohomish County officials applied ecological restoration best practices to the site due to preexisting riparian regulations intended to protect important fish habitats.

The Stillaguamish River is designated as the "Shoreline of the State," and this waterbody is a fish-bearing stream that includes breeding areas for threatened fish communities. The river's classification requires a 150-foot-wide buffer from the OHWM. A tributary of the Stillaguamish and accompanying wetland run west along the southern boundary of the buyout site.

The open space management strategy included the removal of impervious surfaces and invasive plants from the site and the installation of native plant buffers. After removing the impervious areas, the county amended the site with compost-based topsoil to fulfill the requirements of best management practices from the Snohomish County Stormwater Manual. In addition, an on-site stormwater management system was installed to further reduce flood risk. The plan also included maintenance guidelines tied to the use of appropriate soil and vegetation as well as suggesting the use of hand tools to reduce site impacts and carbon emissions.

This case shows that restorative land planning can be applied to a single parcel, and therefore used as part of a larger strategy to address other checkerboarded properties in a community.

While checkerboarding is not ideal, it is important for communities to develop a strategy that results in the best possible use of disconnected buyout parcels, which may include applying best management practices linking flood risk reduction and ecological restoration.

Key Takeaways:

- *Applying ecological restoration best practices to an individual parcel can be replicated to address other disconnected buyout sites in a community.*
- *Applying existing land use codes and stormwater management guidance to a buyout site triggers regulatory standing mechanisms and engages local departments responsible for compliance.*
- *Creating maintenance guidelines is an important, but often overlooked part of a sound open space management strategy.*

Tip: *Engaging with Faculty and Extension Agents at Land Grant Universities and Minority Serving Institutions*

Land Grant Universities and Minority Serving Institutions are comprised of faculty and extension agents who are experts in a range of disciplines that are related to the development and implementation of an open space management strategy. In addition, many employees embrace the mission of the land grant university, which includes an emphasis on deep community engagement and the practical application of knowledge in the field. Minority Serving Institutions, like Historically Black Colleges and Universities, Hispanic Serving Institutions, and Tribal Colleges and Universities, maintain a rich tradition of public service and may prove particularly adept at assisting minority communities develop, implement, and maintain an open space management strategy, including those that have been historically marginalized (see the Lumberton, NC and Linden, NJ case studies). In order to accomplish these aims, faculty often rely on graduate students to assist them, which provides an opportunity to educate and train the next generation of scholars and practitioners who are capable of and committed to advancing disaster resilience.

Image 7. Students visit buyout site in Charlotte, North Carolina. *Image: Gavin Smith.*

Call-Out Box: The Role of Land Trusts in Open Space Management

Land trusts possess many of the skills needed to assist local governments with the purchase and management of acquired buyout lands, including:

- The ability to complete fast real estate deals.
- An extensive working relationship with landowners.
- The widespread use of flexible land acquisition options such as easements.
- Familiarity with title and heir issues.
- An ability to prioritize and assemble parcels.
- The skills required to assist local governments with long-range planning associated with land purchases.
- Familiarity with varied types of land stewardship approaches that align with FEMA buyout properties (e.g., recreational uses, including greenways and parks; conversion of lands to natural areas; wetland protection; habitat restoration; and preserving working lands).

There are, however, several issues that serve as potential barriers to a land trust's widespread participation in the management of buyout lands, including:

- Difficulty serving as an interim land holder.
- Difficulty managing small, often disconnected parcels.
- The slow flow of buyout funds can limit participation as most land trusts do not have large cash reserves to draw from during project implementation.
- The complexities of land transactions associated with buyouts.

According to land trusts there are several ways to better facilitate their participation in the purchase and management of buyout properties, including:

- Adopting a more systems-based approach that includes inventorying and prioritizing contiguous parcels, adopting procedures that allow land trusts to hold land during the buyout process, and providing resources needed to address varied types of land stewardship.
- Training land trust officials on how to access federal, state, and local sources of buyout funding, including how they can be woven together.
- Providing resources to build relationships with landholders and local governments.
- Mapping flood-prone parcels that align with land trust goals like the preservation of environmentally sensitive areas and the adoption of climate change adaptation measures.
- Providing support for pilot projects to test new approaches.
- Providing relocation support services including information, education, and training.
- Sharing knowledge gained across FEMA regions, states, and individual communities that advance good open space management practices.
- Providing funding to state and local government agencies to support land stewardship.

The materials presented in this call-out box are derived from a presentation given by Alison Branco from the New York-Chapter of The Nature Conservancy (March 2022).

NORTHFIELD, VERMONT

CATEGORY: Implementation

SUBCATEGORY: Diverse Partnerships

Introduction

In 2011, Tropical Storm Irene caused major flooding of the river valleys in southern Vermont. The intense rain and rapid runoff caused rivers to rise quickly, flooding homes and businesses with little warning. In central Vermont, the Dog River flooded during Irene, and 156 residences and businesses were acquired with funding from the Hazard Mitigation Grant Program (HMGP). The Two Rivers Ottauquechee Planning Commission, a regional planning organization, helped local governments administer the funds. The highest concentration of buyouts were located in two towns, Stockbridge and Northfield, where 18 and 16 properties were acquired, respectively.

In Northfield, most of the town's buyouts focused on parcels adjacent to the Dog River. The town then used the properties to create a community park. Northfield partnered with state agencies, community organizations, and foundations to finance the design and implementation of the park. These diverse partnerships enabled Northfield to access a broad range of technical support and funding.

Case Study Focus

Diverse Partnerships

This case study highlights that municipalities benefit from diverse partnerships. Northfield, Vermont is a town of nearly 6,000 residents in the Green Mountains. Following Hurricane Irene, the Vermont Downtown Action Team (VDAT) was created. The VDAT, which was comprised of those tasked with marketing, urban design, and planning, created reports and recommendations for eight Vermont communities, including Northfield. The report suggested the creation of a Riverside Park from 4 acres of land assembled from buyout properties.

"The report identified that "a successful park will depend upon multiple partners… including funding partners, maintenance/ service partners, and events/ programming partners."

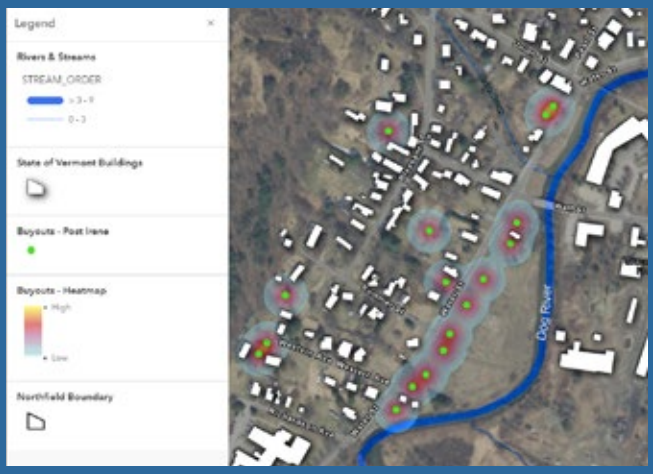
-VDAT Report, 2013

Dog River Park. *Image: Google Street View.*

Town residents, the regional commission, state and federal government agencies, design firms, high school students, and philanthropic organizations pooled their expertise and resources to create Dog River Park.

The park plan restored the river's natural floodplain and provided open space for passive recreation. Organizations involved in the buyout and restoration of the floodplain included the Lake Champlain Basin Project, Friends of the Winooski River, Northfield Historical Society, the Dog River Conservancy, and Norwich University. Other organizations like the Dog River Park Committee, a Subcommittee of the town's Conservation Commission, oversee the management and maintenance of the park and acts as a liaison between the Town and those who use the open space. The committee created a maintenance plan and budget in which they accounted for volunteer labor and the collecting of fees for using the park's pavilion.

Dog River Park plan. *Image: VDAT.*



Buyouts in Northfield along the Dog River. This heatmap illustrates the cluster of acquired parcels along Water St, the Dog River, and Union Brook. *Image: ArcGIS.*

Key Takeaways:

- *The Dog River Park plan incorporated multiple sources of funding and resources to create and maintain a community asset.*
- *A subcommittee of interested town residents (Vermont Downtown Action Team) proved capable of assisting with the administration and maintenance of the park.*
- *A maintenance plan, including the identification of those who are responsible for funding and administering it, is crucial to the success of any municipally-owned park.*
- *The VDAT plan linked open space management, hazard mitigation, and other disaster recovery goals.*

LINDEN, NEW JERSEY

CATEGORY: Maintenance

SUBCATEGORY: Ecological Restoration

Introduction

New Jersey's Blue Acres buyout program is administered by the New Jersey Department of Environmental Protection (NJDEP). Blue Acres was established in 1995 through a bond referendum that focuses on objectives like minimizing checkerboarding, maintaining open space, and furthering farmland and historic preservation. In order to minimize checkerboarding and achieve other state goals, the Blue Acres program prioritizes the acquisition of contiguous parcels. To help with the design and maintenance of the acquired open space the Blue Acres program partners with the state's land grant university, community organizations, and businesses.

Following Superstorm Sandy, Blue Acres received $300 million from FEMA and HUD which led to acquisitions across 20 municipalities and 10 New Jersey counties, most of which are located along the coast.

One hundred days after Hurricane Sandy, cleanup continues at a mobile home park in Holgate, NJ. *Image: Liz Roll.*

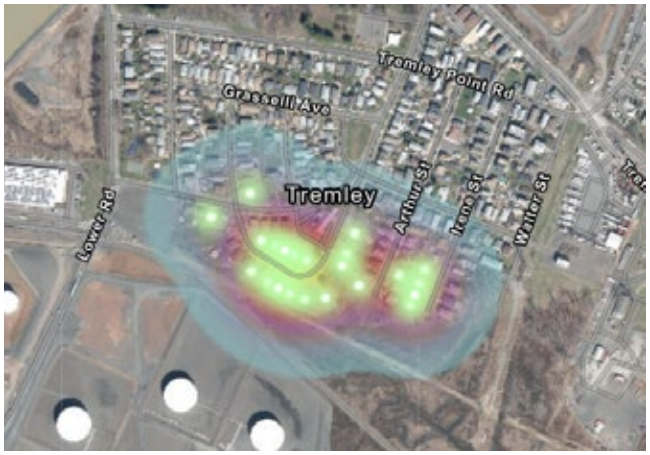
Community volunteers at Earth Day trash clean up at the Linden buyout site. *Image: Renna Media.*

Case Study Focus

Ecological Restoration

Tremley Point, a low-lying neighborhood in Linden, NJ, is located within the Rahway River's floodplain. Several properties were acquired as part of the Blue Acres program then ecologically restored as part of an open space management strategy. The community restored approximately three acres comprised of coastal floodplain forest, meadow, and wetland habitats with native vegetation.

The Linden, NJ buyout and resulting open space management strategy relied on a variety of stakeholders with the technical skills and community knowledge needed to design and implement the project. In 2014, the NJDEP commissioned Dr. Qizhong (George) Guo of

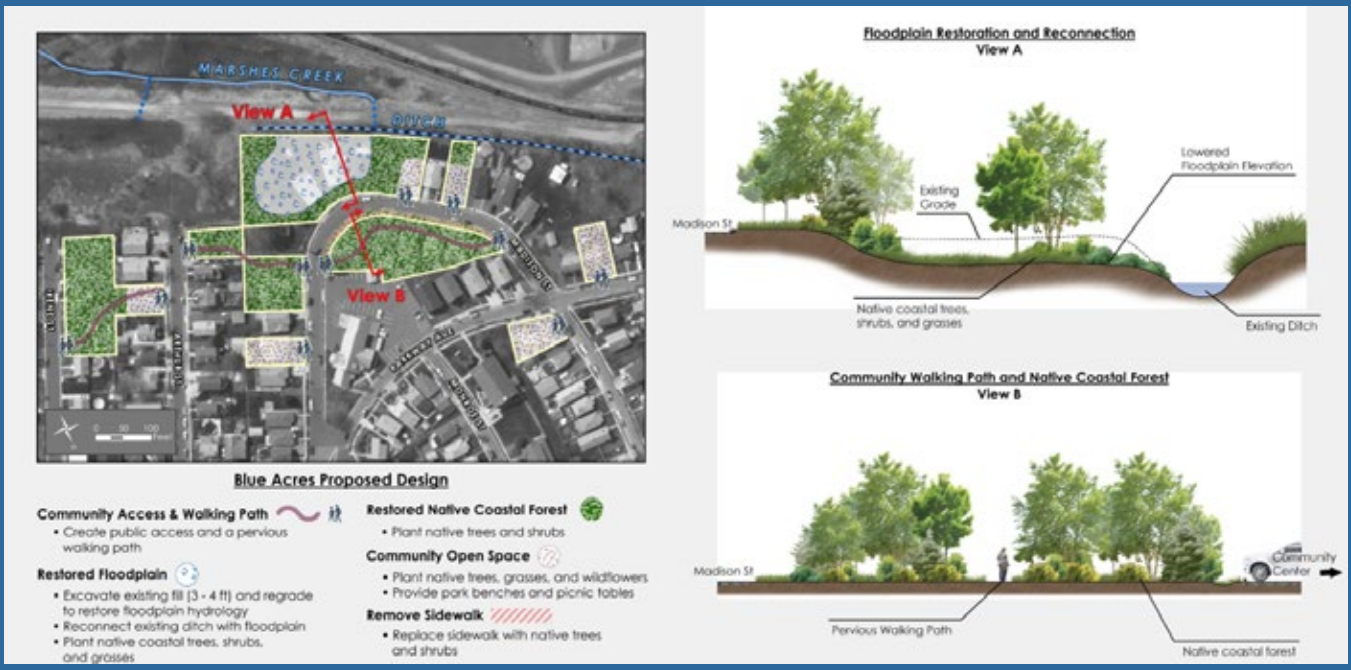


Buyouts in Tremley Point neighborhood in Linden, NJ. *Image: ESRI.*

Rutgers University to develop strategies to reduce flood risk for communities along the Arthur Kill tidal strait, including Linden, New Jersey. His team's recommendations included a suite of green infrastructure and floodplain enhancements. Rutgers received a $2.7 million grant from the Department of the Interior and The Fish and Wildlife Foundation to implement the report's recommendations. The funding paid for the design and construction of a restored ecosystem, paved path, and porous parking lot that was implemented by engineering and design companies Enviroscapes and Princeton Hydro.

Phillips 66 Bay Way Refinery, located nearby, donated volunteers' time and $235,000 to the project.

The Tremley Point green infrastructure project benefited from a state buyout program that avoided checkerboarding by acquiring contiguous tracts, assembling them, and developing an open space management strategy based on the characteristics of the site. Designing and implementing the strategy was achieved through the involvement of varied partners who advanced a vision that emphasized flood risk reduction and the adoption of nature-based solutions.



Proposed Blue Acres Buyout Design. *Image: Princeton Hydro.*

Key Takeaways:

- *The successful creation of ecologically resilient open spaces requires a team that has the expertise and is dedicated to the project's success.*
- *University faculty can play an important leadership role in the development and implementation of an open space management strategy.*
- *State buyout programs can be tailored to avoid problematic issues like checkerboarding and align complementary programs like open space management and the community rating system as described in the next case study.*

STATE OF MISSOURI

CATEGORY: Community Needs Assessment

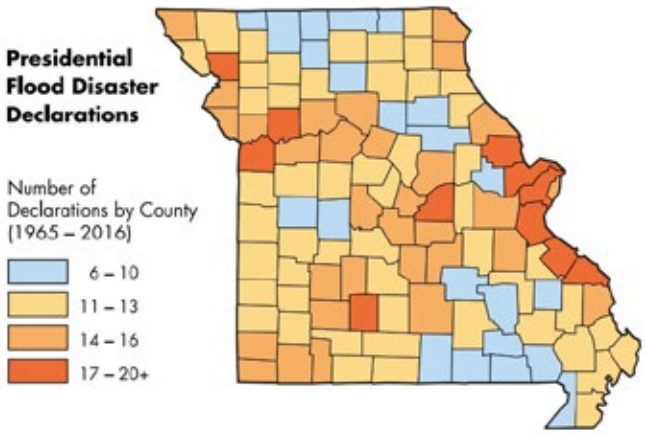
SUBCATEGORY: Applying FEMA's Community Rating System (CRS)

Introduction

In 1993, Missouri and many areas across the Midwest were devastated by severe flooding along the Mississippi and Missouri Rivers. In response, Missouri homeowners participated in a large-scale, FEMA-funded buyout of affected properties. Since the 1993 floods, FEMA, working with the state and local governments, has acquired more than 5,000 properties in Missouri.

Missouri uses a comprehensive approach to mitigating flood risk. This includes encouraging communities to participate in the Community Rating System (CRS). The CRS is a voluntary program that encourages communities to adopt floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program.

The CRS program includes a series of activities and associated credits to include creating higher codes and standards, developing stormwater management plans, informing the community about flood hazards, and adopting open space management strategies. As the community gains more credits, their class rating improves, resulting in a 5% reduction in flood insurance premiums for each level of classification achieved. Actions tied to open space strategies include mapping flood hazard areas, restoring wetlands, and maintaining water retention areas. CRS credits prioritize the restoration of flood-prone land to its pre-development state.



Map of Missouri showing the number of presidentially declared flood disasters by county. *Image: CRS Quick Guide.*

Missouri River in July 1993. *Image: Washington University at St. Louis.*

Case Study Focus

Community Needs Assessment

Because communities decide which activities they want to pursue, the CRS program provides a flexible way to adopt actions that reflect local needs and conditions. The program also allows communities to account for flood mitigation measures that are already in place.

While the CRS program is flexible, it can be difficult for a community to reach required benchmarks and to manage the program due to extensive administrative requirements. One potential solution is to work with the county to join on behalf of the municipality in question. This provides benefits to smaller communities and unincorporated areas that may not have participated in CRS due to the financial and administrative requirements.

In Missouri, the State Emergency Management Agency (SEMA) helps communities that want to participate in the CRS program by providing educational materials and free training resources about best practices. Additionally, Missouri communities can utilize resources provided by the FEMA-funded Silver Jackets program, a multi-agency team that works to reduce flood risk at the state level. SEMA also assists communities with the hydrologic and hydraulic analyses needed for gaining CRS credits.

Key Takeaways:

- *Smaller municipalities or unincorporated areas can participate in the CRS program if they partner with county officials, thereby receiving the benefits of decreased flood insurance rates and reduced flood risk.*
- *State-level capacity-building initiatives can help under-resourced communities earn CRS credits.*
- *Self-assessed, local needs can be met through the CRS program, including those tied to open space management.*

Tip: *Benefits of Buyouts and Open Space: FEMA's Community Rating System*

The Community Rating System (CRS), which is a component of FEMA's National Flood Insurance Program (NFIP), provides a means for participating communities to undertake activities beyond the minimal requirements associated with the NFIP. As communities carry out these activities, they accrue points and as the point totals exceed recognized thresholds, an associated percent reduction in flood insurance rates for policyholders in that jurisdiction is applied. Open Space Preservation is one activity that communities can undertake to accrue points. For more information on the CRS, see: https://www.fema.gov/floodplain-management/community-rating-system.

The ability to identify tangible benefits associated with buyouts can help garner the political support of diverse stakeholder groups, including elected officials and residents, which is an important part of the overall process (see Tip: Assessing Losses Avoided following Buyouts). Jurisdictions that want to assess how their open space management activities could enhance their CRS score should review NOAAs Community Rating System Explorer. This tool helps communities identify areas that are eligible for open space preservation points in FEMA's CRS program. According to the NOAA website, the app does the following:

- Determines areas that qualify for Open Space Preservation (OSP) credit and calculates the points they are eligible to receive.
- Provides exportable, preprocessed maps and information to support the CRS application process.
- Assists with identifying future open space in the floodplain.
- Serves as a flood risk communication tool for residents and decision-makers.

For more information, see: https://coastalresilience.org/project/community-rating-system-explorer/ and the State of Missouri case study.

Tip: *Applying the Community Rating System (CRS): Land Conservation and Nature Based Solutions*

The Nature Conservancy has created a guide describing the CRS benefits associated with land conservation practices titled Community Incentives for Nature Based Solutions: A Guide to FEMA's Community Rating System for Conservation Practitioners. See: https://www.nature.org.

The Grand Forks, ND buyout and greenway, which is discussed next, represents our last case study in this guide. It provides a vehicle to highlight actions that span many of the themes and subcategories discussed, to include accessing the resources needed to develop and implement an open space management strategy.

GRAND FORKS, ND

CATEGORY: Land Planning

SUBCATEGORY: Diverse Partnerships

Introduction

The April 1997, 500-year flood event in Grand Forks, North Dakota and East Grand Forks, Minnesota was one of the most devastating to impact the United States. The flood event, 54 feet above the normal Red River flow, caused a record $3.5 billion in damages, flooded more than 10,000 buildings, and resulted in the evacuation of 95% of the population in both cities. FEMA and the U.S. Army Corps of Engineers were tasked by Congress to resolve habitual flooding problems in these communities. This led to the demolition of 694 private residences and 493 nonresidential buildings. A total of 850 properties were purchased by FEMA through a voluntary buyout program and 161 houses along with 414 other structures were moved to new locations. The land acquired was converted to a 2,200-acre public open space called the Greater Grand Forks Greenway. The greenway, which contains 20 miles of multipurpose pathways, parkland, a golf course, wetlands, wildlife areas, and memorial landscapes took more than 10 years to complete.

The Grand Forks Herald Publishing Company building caught on fire during the flood. *Image: Grand Forks Herald.*

Grand Forks, ND following the 1997 flood. *Image: US Army Corps of Engineers.*

Case Study Focus

Land Planning

The 2,200-acre Greenway has become one of the most cherished landscapes in the community and region. In the immediate aftermath of the flood, that was a difficult concept for residents to embrace, as few could comprehend the value proposition of open space versus lost homes, businesses, and other flooded landscapes. Today, the Greenway is the centerpiece of life in the community, and it fulfills many of the functions described throughout this report.

Today, two buyout neighborhoods have become memorial landscapes, including a campground (Red River State Recreation Area) and a landscape of remembrance. Where retail and commercial buildings once stood, Downtown Grand Forks now includes a waterfront park. Since 1997, six major flood events have occurred, but with

the flood protection program in place, both communities have experienced minimal damages.

The Greenway is managed through a diverse partnership agreement between the City of Grand Forks, Grand Forks Park District, City of East Grand Forks, and the Minnesota Department of Natural Resources. The Grand Forks Park District manages four areas including: Riverside, Kannowski, Lincoln Drive Park, and Lincoln Drive Golf Course in partnership with the city. The City of East Grand Forks owns and manages most of the 1,200 acres of greenway located in Minnesota. The Minnesota Department of Natural Resources owns and operates the Red River State Recreation Area, located in downtown East Grand Forks.

A variety of events occur in Lincoln Drive Park throughout the year to commemorate those who called this landscape home. *Image: Erica LaMarca.*

The Red River State Recreation Area was once the site of a residential neighborhood. *Image: Erica LaMarca.*

Grand Forks/East Grand Forks Greenway. *Image: City of Grand Forks.*

Key Takeaways:

- *Complex partnership agreements can work if appropriate plans are put in place.*
- *Buyout sites can be used for a number of purposes, including a state recreation area, multi-purpose trails, a golf course, wetlands, wildlife areas, and memorial landscapes.*
- *Open space management activities can include regular programming of commemorative events.*

Resources for Open Space Management Activities

This guide emphasizes the power of partnerships. Identifying the resources needed to develop, implement, and maintain an open space management strategy over time is critically important. Communities that successfully navigate this process have thought creatively about what they would like to achieve by partnering with varied organizations that provide the types of resources needed to help them accomplish their goals. Thinking about the broader array of resources available to them rather than just looking for funding allows communities of differing capabilities to address the challenges associated with open space management more effectively. This does not mean that funding isn't critically important, but it should be seen as part of a larger set of interconnected resources.

As demonstrated throughout this guide, resources are comprised of three types: 1) funding, 2) policies, and 3) technical assistance. Each of these resource types is described and organized in a matrix that allows the reader to identify the types of resources (F = funding, P = policy, and TA = technical assistance) that can be used to accomplish the tasks associated with the open space management process described in this document. In addition, organizations are identified that may provide these resources as part of an open space management team.

Funding

The FEMA-supported buyout of hazard-prone properties does not provide funding to assist communities develop and implement an open space management strategy. Therefore, communities must identify the resources needed to implement their open space management ideas, including the development, implementation, and long-term maintenance of design strategies. A growing number of states have begun buyout programs including the Blue Acres Program in New Jersey (see the Linden, NJ case study). Local governments, including those highlighted in this document, have used municipal and county-level revenue sources to acquire properties as well as develop and implement open space management strategies. Examples include local stormwater management fees, capital improvement funding, and annual operating budgets drawn from Parks and Recreation departments. The Charlotte / Mecklenburg County, NC; Harris County, TX; and Tulsa, OK cases exemplify communities that have used local funding to support buyout efforts, including the development, implementation, and maintenance of an open space management strategy. Additional funding sources may be provided by corporations, while members of an open space management team like regional planning organizations, universities, and non-profit organizations may help local governments write and implement grants that fund these types of activities.

Policy

Policies are described in this guide as a "resource" because supportive policies created at the state and local level are often required to implement important elements of the open space management process. For instance, this approach has been adopted in places like Charlotte/Mecklenburg County, NC, Tulsa, OK, and Harris County, TX where they have developed locally funded buyout and open space management strategies to address the limitations of restrictive federal policies. An additional example of relevant local policy includes the application of rules governing the maintenance of vacant land (i.e., mowing schedules, dumping restrictions). Modified policies may require the development of a legal agreement in which a local government leases a vacant lot purchased under the buyout program to an adjacent property owner or community group. The lessee agrees to maintain the property in accordance with an established policy such as one governing the creation and maintenance of a

community garden. Relevant state policies may include actions associated with state-funded buyout programs, riparian buffer requirements, setback rules for properties adjacent to rivers, or state rules governing floodplain management and watershed planning. State emergency management agencies are typically the pass-through organization or grantee for federal buyout funds, and they are likely to serve as a community's primary point of contact regarding the eligible use of buyout lands.

As part of the open space management process, community officials should review existing local, state, and federal policies and laws in place and assess how they "fit" with the issues described in this document as well as the unique circumstances a jurisdiction may face when developing an open space management strategy (see Call-Out Box: Legal Aspects of Open Space Management). This will help to improve consistency across governmental agencies and departments and help to identify or modify policies that align with broader community goals involving topics such as recreation, resilience, floodplain management, conservation, commemoration of cultural resources, public health, and aesthetics (See Callout Box: Identifying Goals in Community Plans that Align with Open Space Management Strategies and Tip: Assessing Plans Using the Resilience Scorecard).

Technical Assistance

Technical assistance, which includes the provision of training, education, and outreach is delivered by multiple groups, including government, non-profits, quasi-governmental organizations, and members of the private sector, among others. In some cases, the delivery of technical assistance may be provided at little or no cost to the local government. However, the ability to access these resources will require individuals within the open space management team to commit the time needed to identify resource providers and solicit their assistance. While local government officials often assume this task, others within the larger open space management team may be assigned this responsibility, particularly in smaller jurisdictions with limited staff. Examples of technical assistance may include the donation of time or expertise, including the writing and implementation of grants; designing and constructing walking trails, benches, and commemorative materials; or the provision of expertise regarding the use of native plants and the removal of invasive species (See Checklist: Creating an Open Space Management Team).

Use of the Open Space Management Resource Matrix

Communities may use the open space management resource matrix to help outline the actions that comprise an open space management strategy, the resources needed to accomplish each action, and the organizations that provide the varied types of resources (See Checklist: Creating an Open Space Management Team and the Open Space Management Resource Matrix in the Appendix of this guide). Communities may want to expand the list of actions listed in Figure 6 beyond the components and subcomponents described in the buyout process section of this guide and the Call-Out Box: Contracting Consulting Services Across the Open Space Management Process. Potential team members may be identified, in part, by a review of the Checklist: Creating an Open Space Management Team, to include those who are increasingly active in the buyout process as part of a managed retreat strategy, as described in the subsequent call-out box.

Figure 6. Open Space Management Resource Matrix. Fill in cells for each category with organizations and/or team members you have identified to carry out all open space management actions.

		Funding	Technical Assistance	Policy	Notes
LAND PLANNING	Community Engagement				
	Land Suitability Analysis				
	Land Use Options				
	Implementation Strategies				
	Fundraising				
SITE DESIGN	Community Engagement				
	Advanced Planning				
	Schematic Design				
	Design Development				
	Construction Documentation				
	Permitting				
IMPLEMENTATION	Project Reporting and Fiscal Oversight				
	Construction, Administration, and Monitoring				
	Mobilization and Site Preparation				
	Demolition, Construction, Oversight				
	Final Review and Certification				
	Funding Identification				
	Closeout and Review				
	Delegation of Management and Maintenance Roles				
	Monitoring				
	Regulatory Compliance				
	Quality Assurance				
	Maintenance				

Call-Out Box: Buyouts, Managed Retreat, and Resettlement in an Era of Climate Change

Buyouts are increasingly mentioned as part of a managed retreat strategy (Freudenburg et al. 2016; Hino et al. 2017; Mach et al. 2019; Pinter and Rees 2021). Using buyouts for this purpose requires a long-term vision. Additionally, managed retreat requires a willingness to commit the time needed to disinvest in hazardous areas and invest in other, less vulnerable locations. A managed retreat strategy requires: 1) accessing additional funds to address the buyout of non-FEMA eligible housing; 2) acquiring and demolishing infrastructure, including roads, water, sewer, and public facilities; and 3) identifying sites where supporting infrastructure, critical facilities, and replacement housing can be built (See Tip: Resources to Develop and Implement a Managed Retreat Strategy).

Case study examples like those described in Lumberton, NC demonstrate the value of developing a plan that identifies multiple buyout grants, including the strategic identification of properties that remained after an initial buyout. The Charlotte/Mecklenburg, NC, Tulsa, OK, Harris County, TX, and Linden, NJ cases demonstrate the value of establishing local and state-funded buyout programs that provide more flexibility by aligning eligibility with local community needs and goals. These examples offer lessons for those communities that are considering the development of a managed retreat strategy.

In some cases, communities have used FEMA hazard mitigation funds to relocate their town versus acquiring and demolishing at-risk housing, which provides a useful example of how this work aligns with managed retreat strategies. Specific lessons can be drawn from actions that occurred following the 1992 Midwest floods (Pinter and Rees 2021). Efforts undertaken in Valmeyer, Illinois and Pattonsburg, Missouri, for instance, required pulling together multiple funding sources to include those needed to rebuild replacement infrastructure, purchase developable land, and build public facilities on a new site. Other examples of relocation include those underway in Isle de Jean Charles, Louisiana and Newtok, Alaska (see Images 8 and 9).

Images 8 and 9. Buyouts and managed retreat in Isle de Jean Charles, Louisiana. The photos show the sentiments of a homeowner who has chosen to stay in the Isle de Jean Charles community as well as replacement housing located in Houma, Louisiana, more than 20 miles inland. The construction of replacement housing following buyouts is often given limited attention, which can prove problematic for communities that want to retain residents and the associated tax base. *Images: Gavin Smith.*

Situating buyouts in a larger climate change adaptation framework can also help jurisdictions plan for how selective or targeted buyouts and the resulting open space can be used to support protect and accommodate strategies. While the purchase of large contiguous parcels can result in significant open spaces and further a broader disinvestment strategy, the selective acquisition of properties can be repurposed as greenways and water retention areas adjacent to development that will remain in place. This approach is being used in areas where much of the city that is located outside of flood hazard areas has chosen to remain in place. Examples include urban areas described in the Charlotte/ Mecklenburg County, NC and the Tulsa, OK case studies.

Achieving multiple goals spanning hazard mitigation and climate change adaptation benefits from sustained coordinative actions across plans that may exist in a community. Reviewing a community's hazard mitigation plan and climate change adaptation plan (if one exists), for example, is an important part of this process. This assessment should involve bringing together those who are responsible for a plan's development and maintenance over time and evaluating how buyout projects align with a larger managed retreat strategy. See Call-Out Box: Identifying Goals in Community Plans that Align with Open Space Management.

Tip: *Accessing the Resources to Develop and Implement a Managed Retreat Strategy*

For more information regarding how to identify and procure assistance to create and implement a managed retreat strategy, see the Ready to Fund Resilience Toolkit at https://adaptationprofessionals.org/ready-to-fund-resilience-toolkit/#:~:text=The%20Ready%2Dto%2DFund%20Resilience,in%20the%20Resilience%20Ecosystem%20Program and the Managed Retreat Toolkit at https://www.georgetownclimate.org/adaptation/toolkits/managed-retreat-toolkit/introduction.html.

Ready-to-Fund Resilience

American Society of Adaptation Professionals

Climate Resilience Consulting

Case Study Lessons

Figure 7. Case Study Lessons. The lessons drawn from the case studies found throughout this guide are organized across the themes and subcategories listed in Figure 3 to provide readers a snapshot of information from various community's open space management strategies.

Case Studies	Theme	Subcategory	Key Takeaways
Oso, WA	*Site Design*	*Memorialization*	Coordination among residents; local, state, and federal government officials; and the design firm who donated their time and expertise was critical to the success of the project. Memorialization of buyout sites can achieve commemorative, recreational, educational, and ecological objectives. Funding for projects like memorials can be raised from multiple sources, including federal, state, and local governments, as well as non-governmental organizations.
Detroit, MI	*Community Needs Assessment*	*Environmental Justice*	Open space management can address a community's environmental justice needs. Community non-profit organizations can help define open space management planning goals. Buyout properties can serve as an important part of a larger urban stormwater management program. Collective ownership of resources on buyout parcels benefits residents. Land trusts can serve as partners for open space management and lessen the administrative burden on municipalities.
Erie, CO	*Site Design*	*Environmental Design*	Proactive, environmentally focused open space management design is an effective way to protect a rapidly growing community from natural hazards like floods and wildfires. Appropriately programmed open space land can result in low-maintenance alternatives. Collaborating with community partners can foster locally-specific options.
Charlotte/ Mecklenburg, NC	*Site Design*	*Multi-Objective Planning*	Buyout properties provide an opportunity to reuse and recycle materials with the help of local partners like Habitat for Humanity. Well-planned open space management strategies can achieve multiple objectives, including improved water quality, flood risk reduction, environmental education, and ecological restoration. The use of local stormwater management fees to purchase hazard-prone housing allows local governments to create eligibility criteria that reflects local conditions.

Case Studies	Theme	Subcategory	Key Takeaways
Harris County, TX	*Implementation*	*Conveying Complex Funding Structure*	Complicated systems require clear graphic communication and transparency to keep residents informed and engaged. Public and private partnerships can improve park access equity. Education and engagement can lead to residents approving the utilization of local funding sources to support open space management initiatives.
Tulsa, OK	*Maintenance*	*Creative Funding Strategies*	Creating local funding sources for buyouts provides a community with flexible resources to address local needs and conditions. Disasters can lead to significant policy change, including the creation of a comprehensive open space management strategy. Garnering political buy-in can foster proactive open space management land programming, including that supported with internal and external funding.
Lumberton, NC	*Land Planning*	*Assistance from Committed Partners*	Design documents like Floodprint present a holistic approach to community needs assessment, land planning, and implementation. A long-term partner, like CDDL, can assist an under-resourced community address unique challenges like checkerboarding by identifying strategic parcels, that when purchased with additional grants, provide a continuous set of properties that can be programmed in a manner that serves as a community-wide asset.
Dauphin Island, AL	*Implementation*	*Neighborhood Parks*	A park can improve a community's perception of open space, leading to greater residential investment in its maintenance. While checkerboarding is not preferable, the use of individual parcels as neighborhood parks benefits community members, and through thoughtful planning, can connect with other systems like greenway trails. Municipal-community partnerships can assist with open space management in smaller towns with limited resources.
Snohomish County, WA	*Land Planning*	*Ecological Restoration*	Applying ecological restoration best practices to an individual parcel can be replicated to address other disconnected buyouts sites in a community. Applying existing land use codes and stormwater management guidance to a buyout site triggers regulatory standing mechanisms and engages local departments responsible for compliance. Creating maintenance guidelines is an important, but often overlooked part of a sound open space management strategy.

Case Studies	Theme	Subcategory	Key Takeaways
Northfield, VT	*Implementation*	*Diverse Partnerships*	The Dog River Park plan incorporated multiple sources of funding and resources to create and maintain a community asset. A subcommittee of interested town residents (Vermont Downtown Action Team) proved capable of assisting with the administration and maintenance of the park. A maintenance plan, including the identification of those who are responsible for funding and administering it, is crucial to the success of any municipally-owned park. The VDAT plan linked open space management, hazard mitigation, and other disaster recovery goals.
Linden, NJ	*Maintenance*	*Ecological Restoration*	The successful creation of ecologically resilient open spaces requires a team that has the expertise and is dedicated to the project's success. University faculty can play an important leadership role in the development and implementation of an open space management strategy. State buyout programs can be tailored to avoid problematic issues like checkerboarding and align complementary programs like open space management and the community rating system.
State of Missouri	*Community Needs Assessment*	*Applying FEMA's Community Rating System (CRS)*	Smaller municipalities or unincorporated areas can participate in the CRS program if they partner with county officials, thereby receiving the benefits of decreased flood insurance rates and reduced flood risk. State-level capacity-building initiatives can help under-resourced communities earn CRS credits. Self-assessed, local needs can be met through the CRS program, including those tied to open space management.
Grand Forks, ND	*Land Planning*	*Diverse Partnerships*	Complex partnership agreements can work if appropriate plans are put in place. Buyout sites can be used for a number of purposes, including a state recreation area, multi-purpose trails, a golf course, wetlands, wildlife area, and memorial landscapes. Open space management activities can include regular programming of commemorative events.

The lessons drawn from each case study as well as the additional material presented throughout this guide are intended to provide the information needed to create and implement a well thought out open space management strategy. However, multiple barriers exist that require changes to existing federal, state, and local rules and regulations. Next, a call to action, underpinned by a set of policy recommendations, is provided to describe specific steps that can be taken to advance the widespread success of open space management strategies across communities of varied capabilities.

A Call to Action: Policy Recommendations to Improve Open Space Management Processes and Outcomes

While it is widely recognized that buyouts provide one of the most effective ways to reduce flood risk and adapt to a changing climate, the utilization of the land is often given less attention, resulting in a number of missed opportunities. Thoughtful open space management strategies can result in improved recreational opportunities, better water quality, enhanced stormwater management, increased economic development, and other benefits. However, rural, and under-resourced communities often struggle to accomplish these aims given limited access to the funding, supportive policies, and technical assistance required to develop, implement, and maintain open space management strategies. Larger and wealthier communities may possess the resources needed to develop a sound open space management strategy, but some fail to make this a priority.

There are many challenges associated with creating, implementing, and maintaining open space on buyout lands. Beyond the suggestions in this guide, communities will benefit from policy changes at multiple levels of government. The following policy recommendations are framed by the three resource types discussed throughout this guide: 1) funding, 2) policy, and 3) technical assistance.

Expand the Use of Federal Funds

Provide federal funds for planning, site design, implementation, and maintenance of open space associated with buyouts. Communities with fewer resources routinely struggle to effectively manage open space following buyouts. This includes smaller, rural communities, as well as urban areas with limited discretionary budgets and staff. To meet these communities' needs, additional funds should be folded into existing Hazard Mitigation Assistance (HMA) grants management costs. While management costs are allocated to states and local governments to help administer HMA grants, they do not include funding for the development, implementation, and management of open space management strategies. In order to effectively incorporate the development of open space management strategies into the buyout project life cycle (as depicted in Figure 1), this requires appropriate levels of federal funding to do so. This suggested approach recognizes that the thoughtful use of open space is an important component of a larger flood risk reduction strategy and a means to achieve several complimentary community goals, including the adoption of nature-based solutions.

Image 10. Former automobile junkyard converted to a dog park in Kinston, NC. This project was implemented using a state fund created following Hurricane Floyd. The fund focused on acquiring junkyards and hog farms located in the floodplain and converting the land to open space. The grant was administered by the NC Department of Environment and Natural Resources and drew from the state's rainy-day fund (savings set aside by the legislature for unexpected needs). *Image: Gavin Smith.*

Align BRIC Grants and Buyouts

Improve the alignment of Building Resilient Infrastructure and Communities (BRIC) grants and buyout sites. BRIC grant funding should be used to develop and implement nature-based solutions on buyout lands, including their integration with other community goals like advancing recreation, improved water quality, riparian restoration, cultural and historic commemoration, and environmental education. Explicit federal guidance and training on how this can be achieved would be helpful. As part of proposed amendments to existing guidance materials, FEMA should consider including points in their BRIC applicant scoring system for those communities who link BRIC and buyout projects through the development of a strategy that emphasizes nature-based solutions. Acting on this recommendation also requires addressing the challenges faced by communities who struggle to access HMA grants, including BRIC.

Reduce the Complexity of the Buyout Process

Reduce the complexity of the overall buyout process, including open space management-related activities. One of the challenges facing HMA grant programs is the complexity of the application process. This often results in low-capacity communities failing to develop award-winning applications, or if buyout projects are awarded, the implementation of a thoughtful open space management strategy remains uncommon. An explicit part of FEMA's Strategic Plan is to reduce program complexity, and yet, the clear operationalization of this high-level goal remains elusive. As FEMA develops and implements an expanded direct technical assistance (DTA) program focused on writing and implementing BRIC grants, targeted assistance tied to open space management should be included in this effort.

Enhance the Role of State Agencies

Encourage state government agencies to play a greater role in delivering technical assistance and funding to support open space management activities on FEMA-funded buyout lands. States should support FEMA's DTA program by increasing the involvement of state-level environmental management agencies and departments. Many states possess grant programs addressing open space management

Image 11. University students learn about open space management activities. This field trip to Charlotte, North Carolina highlighted open space management activities, including the ecological restoration of the Chantilly neighborhood buyout site. *Image: Gavin Smith.*

linked to environmental, recreational, and economic development goals. In order to help facilitate this process, state programs should be aligned with FEMA-funded buyout programs, drawing on the technical expertise of state environmental management agency officials to assist local governments develop and implement open space management strategies.

Increase Buyout Incentives

Incentivize buyouts and the creation of open space management strategies through improved federal policies*.* One way to encourage greater non-federal participation is for FEMA to consider increasing incentive-based policies tied to the creation and implementation of open space management strategies in areas subject to natural hazards. Examples include: 1) providing additional points in the National Flood Insurance Program's Community Rating System for the creation and implementation of open space management strategies in flood hazard areas, and 2) including state-funded buyout programs in the criteria used to meet an Enhanced State Hazard Mitigation Plan status. The current number of points earned for creating and maintaining open space areas has been criticized as being too low. Increasing the points received for maintaining open space in participating CRS communities could further participation. One option to consider is providing more CRS points if a community creates and implements a well thought out open space management strategy that meets established criteria tied to flood risk reduction and other community goals discussed throughout this guide. States and territories that develop an enhanced hazard mitigation plan receive an additional 5 percent in Hazard Mitigation Grant Program funds following a federally declared disaster. In larger events, the increased funding can be substantial. We suggest that the additional funds garnered by enhanced states could be allocated to support open space management activities at the local level.

Enhance the Role of Local Governments

Encourage local governments to identify buyout projects in local hazard mitigation plans and provide additional funding to support open space management activities. Local governments are encouraged to identify projects in their hazard mitigation plans, but few undertake this action, including the development of an associated open space management strategy. The original intent of the Disaster Mitigation Act of 2000 was to require the development of pre-disaster hazard mitigation plans to speed up the processing of Hazard Mitigation Grants by pre-identifying eligible projects and including them in plans. FEMA should consider returning to this idea and require local governments to identify specific buyout properties (or other hazard mitigation projects) and include them in their hazard mitigation plan. Priority access to HMA funds should be given to those communities that identify projects, including the allocation of additional resources needed to fund some or all the costs associated with developing and implementing an open space management strategy.

Improve the role local governments play in funding open space management activities, recognizing that some communities do not possess the resources to undertake this type of activity. Some local governments, like Tulsa OK, Charlotte / Mecklenburg County, NC, and Harris County, TX have drawn from stormwater management fees, parks and recreation budgets, and other sources of revenue to develop and implement open space management strategies. This approach should be explored by more communities to include reprogramming funding tied to the growing number of climate change adaptation plans and associated projects. Another option to consider is to create a cost sharing program whereby FEMA provides the funds needed to develop and implement an open space management strategy while local governments and other non-federal partners provide the resources required to maintain the land over time. Considering the challenges faced by smaller, less affluent communities, the non-federal cost share should reflect a sliding scale based on a community's ability to cover maintenance costs.

Support Peer-to-peer Networks

Develop state and local peer-to-peer support networks focused on providing information and insights. Emphasis should be placed on the dissemination of information describing how communities of varied capabilities were able to successfully obtain funding, access technical assistance, and develop the policies needed to create, implement, and maintain an open space management strategy. For example, communities that have adopted a local open space management funding program should share lessons with others regarding how they accomplished this significant achievement. These lessons should be codified through the creation and maintenance of a federally managed database describing these activities.

In addition to the creation of a database, a geographically distributed peer-to-peer network should be established. This network of individuals skilled in creative financing, design, and community planning should stand ready to assist others that are developing and implementing an open space management strategy in their respective region. While FEMA currently maintains a database of lessons learned relative to HMA grants management, this database should be expanded to include specific information related to the development and implementation of post-buyout open space management strategies. To be more successful, funds should be allocated to support the collection and dissemination of the information across FEMA regions.

The emergency management community already has in place a national mutual aid program, which allows states and a select cadre of individuals to provide post-disaster assistance to communities located within participating mutual aid states. Expanding the delivery of mutual aid to include open space management insights across jurisdictions should be discussed with FEMA and state leaders responsible for the administration of the mutual aid program to consider how this might be accomplished. Ideally mutual aid would be provided before and after a disaster, not just following federally declared events. These recommendations will require modifying existing mutual aid program rules. Furthermore, an effort should be made to better align mutual aid and FEMA's Direct Technical Assistance program discussed next.

Deliver Technical Assistance

Increase the delivery of technical assistance needed by local governments to address open space management issues, challenges, and opportunities. Local governments and states have long expressed a need for more federal capacity-building initiatives. Lessons should be drawn from the emerging Direct Technical Assistance (DTA) program led by FEMA to address HMA grants management needs and the program expanded to include the provision of technical assistance tied to open space management. First, a nationwide training of design professionals, land trusts, university faculty and extension specialists, and others listed in the Open Space Management Team Checklist should be conducted and a program developed to sustain the delivery of outreach to local governments at no cost to them. The delivery mechanisms for this training effort may involve FEMA's Emergency Management Institute, FEMA hazard mitigation staff and the on-call cadre of Disaster Assistance Employees, FEMA's Community Planning and Capacity Building staff (many of whom are professional land use planners), on-call FEMA contractors, professional associations, and land grant university faculty and engagement specialists.

Improve the delivery of technical assistance by underutilized partners, including professional associations, Land Grant Universities, and Minority Serving Institutions. In addition to technical assistance as delivered by states and local governments in the peer-to-peer network and FEMA personnel and contractors, other organizations should play a greater role in taking on this challenge.

For instance, professional associations, like the American Society of Landscape Architects (ASLA) and the American Planning Association (APA), both of whom possess divisions that address disaster resilience, should deliver training and direct technical assistance to communities, building on existing programs like APAs Community Planning Assistance Teams.

A primary goal of Land Grant Universities and Minority Serving Institutions (academic institutions whose enrollment of a single or combination of minorities exceed fifty percent of the student population) is to assist communities in their respective states through applied research, the practical dissemination of scientific knowledge, and community engagement. Aligning university faculty and extension specialists with the Extension Disaster Education Network (EDEN), a consortium of land grant universities and extension agents focused on advancing disaster resilience, provides promise, assuming a targeted outreach and engagement strategy can be developed that addresses the unique needs associated with open space management. We suggest the creation of disaster resilience extension agents, including those trained in design-related disciplines like landscape architecture, land use planning, and civil engineering as well as those skilled in public administration, parks and recreation planning, finance, and grants management. It is imperative that the individuals identified must possess both the necessary technical expertise as well as a commitment to engage with communities over long time periods. In addition, an effort should be made to include students as part of the program, thereby helping to educate and train the next generation of those individuals with the skills and commitment needed to assist communities over time.

Image 12. University students working in the Disaster Recovery Operations Center following Hurricane Matthew. Students, under the supervision of faculty and practitioners, assisted six hard-hit low-capacity communities plan for the thoughtful uses of buyout properties as part of a two-year effort funded by the state of North Carolina, the Department of Homeland Security, the Coastal Resilience Center, and the North Carolina Community Foundation. For more information on this effort, see Smith and Nguyen (2021). *Image: Gavin Smith.*

Educate and Train the Next Generation

Educate and train the next generation of practitioners and scholars to assist communities address the issues surrounding the thoughtful management of open space. A rapidly growing number of communities across the United States and around the world need assistance with buyouts, including those who see this technique as part of a managed retreat strategy. At the same time, a rapidly growing number of students are seeking to gain the knowledge and skills needed to pursue a career addressing climate change-related issues. Given the increasing demand for assistance as well as growing student interests, it is incumbent on universities and community colleges to teach the next generation of students the knowledge and skills required to address buyouts, including the range of open space management issues described in this guide. The development of inclusive, thoughtful, effective, and sustainable open space management strategies can and should play an important role in addressing perhaps the greatest challenge facing the world in the 21st century, which is to assist communities adapt to our changing climate.

Conclusion

The intent of this guide was to help inform those tasked with the development and implementation of an open space management strategy on FEMA-funded buyout lands, an area that has received too little attention. We believe the material provided will allow you to achieve this aim. As our climate changes, and disaster losses continue to rise, it is imperative that communities develop diverse and sustained partnerships needed to address the many challenges as well as the unique opportunities to make communities both more resilient and better places to live, work, and play.

Appendices

The appendices include the following: 1) a review of the open space management literature, 2) a list of open space management documents, 3) a description of the approach taken to develop this guide, 4) a list of advisory board members, 5) an open space management team template, 6) an open space management resource matrix template, and 7) references.

Appendix 1: Review of the Open Space Management Literature

There is a small but growing academic literature focused on the issues surrounding buyouts and open space management, although significant research gaps remain. The practitioner-based literature has focused on general guidance associated with the eligible uses of the land or an overview of final products rather than the process required to undertake such efforts or a discussion of how to manage the land over time. Nor has much been written about actionable guidance for use by local governments and others. The intent of discussing this literature is to provide additional information for practitioners and to inform identified shortfalls discussed in this guide that could lead to new applied research and much needed changes in public policy.

Much of the literature describes the rationale or importance of planning for open space management, including ecosystem restoration (Conrad et al. 1998; Highfield et al. 2019), reconnecting members of the community to existing natural resources through recreational infrastructure (Coastal Dynamics Lab 2019; Flink 2020; Kihslinger and Salvesen 2017; Brand and Nicholson 2016; Freudenberg et al. 2016), economic development (Hanso and Lemanski 1995), municipal finance (BeDor et al. 2020), and the memorialization of communities following a buyout (Zavar 2019). The ability to achieve these outcomes, while highly laudable, are often constrained as research suggests that most buyout properties end up as vacant lots rather than parks or greenways (Zavar and Hagelman 2016) and the scattered spatial patterns associated with buyouts significantly limit design alternatives (Coastal Dynamics Design Lab 2019; Ben Dor et al. 2020; Smith et al. 2014). Furthermore, while the costs of maintaining buyout properties often remain uncertain, research shows that they can prove significant, especially for smaller communities (Ben Dor et al. 2020).

Most of the practice-based literature emphasizes “success stories” that describe the product (i.e., greenways, ballfields, wetland restoration, etc.) and attendant risk reduction or losses avoided (FEMA 2019; FEMA 1998) rather than the process required to achieve these goals. Less attention has been

Image 13. Christchurch, New Zealand buyout property with intact landscaping. This type of open space management was part of an effort to commemorate individual sites and allow former residents to harvest fruits and flowers after their land was sold. *Image: Gavin Smith.*

placed on a critical description of key open space management challenges and the actions required to address them. In one notable exception, The Environmental Law Institute has described varied open space management approaches (emphasizing environmental restoration) based on management intensity (no intervention, minimal action, rehabilitation, and reestablishment) and provides descriptive vignettes of communities that have adopted these approaches (2017). However, the guide describes management options broadly, with limited attention placed on the steps communities of differing capabilities undertook to achieve their goals, including how open space management strategies were designed and funded, the organizations that undertook the varied tasks required, and how the properties are managed over time.

Following major disasters design teams often create visually appealing renderings of options that are unattainable, with less attention paid to clear implementation mechanisms, including detailed drawings, financing, and the programming required to make these ideas a reality. As a result, many of the preliminary drawings and general plans remain unrealized, unless those skilled in grants writing, design, and technical assistance continue to help years after the buyouts have occurred (Smith and Nguyen 2021). Compounding this problem is the lack of federal funding provided to communities to support the design and implementation of open space management strategies once the homes are acquired and demolished. Instead, communities are left to figure out the land programming, site design, and associated financing, which has led to an uneven approach to managing the resulting open space. Communities with fewer financial and technical resources often struggle with the management of the buyout lands (Smith et al. 2021). In addition, a homeowner's deep attachment to a place can lead some to oppose the buyout offer, leaving a set of checkerboarded properties.

The academic literature also shows that historically marginalized groups are often excluded from decisions surrounding the buyout process, including how open space is utilized (Baker et al. 2018; Binder and Greer 2018; De Vries and Frasier 2012; Elliott et al. 2020; Frasier et al. 2003; Nguyen 2020). The combination of exclusionary planning processes and the creation of unattainable designs furthers the gap between those communities that do or do not have the resources to develop, implement, and maintain an effective open space management strategy.

Image 14. Christchurch, New Zealand landscape post buyout. This image was taken eight years after the acquisition of more than 8,000 properties and prior to the development and implementation of regional regeneration (open space management) plans. Most of the buyout properties are contiguous, which allows for a wide range of design options. *Image: Gavin Smith.*

Some of the case studies discussed in this guide, including Tulsa, OK and Charlotte/Mecklenburg County, NC, describe how their open space management programs are funded, to include the use of stormwater management fees or drawing from parks and recreation budgets (Patton and Chakos 2009; MacDonald 2010). These examples point to communities that have made a financial commitment to the process, which may require diverting resources from finite operating budgets. Lower capacity communities do not typically have access to funding for open space management, whereas others may decide not to reprogram available budgets.

The Lumberton, NC case describes how university faculty developed open space management design options and assisted the city procure a BRIC grant to implement open space management ideas. In New Zealand, "regeneration plans," which describe the proposed uses of open space are a required part of the larger buyout process (Smith et al. 2021). The degree to which these plans are operationalized post-buyout, including the more than 8,000 parcels acquired following the 2011 Christchurch Earthquake remains uncertain more than ten years later. In summary, the literature points to the value of pre-event planning coupled with obtaining the resources needed to make open space management plans a reality, the importance of including all citizens in the planning process, and creating improved guidance to assist communities.

Image 15. Owner opposition to buyout. Metata, New Zealand homeowner expressing their dissatisfaction with the buyout of homes following a landslide event. *Image: Gavin Smith.*

Image 16. Property owner sign following the Kilauea eruption in Hawaii. This sign highlights the property owner's desire to sell their land following several disasters, including the Kilauea volcanic eruption. The buyout of homes inundated by lava in Hawaii presents open space management challenges tied to the use of the land. County officials are exploring how these properties can be allowed to revert to their natural state over time, including the regrowth of native flora. *Image: Gavin Smith.*

Appendix 2: Open Space Management Documents

The following documents can be used to supplement the open space management guide.

Property Acquisition Handbook for Local Communities: A Summary for States. October 1998. See Phase IV, Open Space Management, Chapters 1 (Open Space Use), Chapter 2 (Planning) and Chapter 3 (Implementation and Long-Term Management). See: https://www.fema.gov/pdf/government/grant/resources/hbphase4.pdf.

Ready to Fund Resilience Toolkit. 2022. American Society of Adaptation Professionals and Climate Resilience Consulting. 2022. See: https://adaptationprofessionals.org/ready-to-fund-resilience-toolkit/?utm.

Buy-in for Buyouts: the Case for Managed Retreat from Flood Zones. 2016. Lincoln Institute for Land Policy, Washington, D.C. Authors: R. Freudenburg, E. Calvin, E. L. Tolkoff, and D. Brawley.

Living with the Saint Vrain. Lyons, Colorado: Designing a More Resilient Future. 2014. Community Planning Assistance Team Report. Chicago, Illinois: American Planning Association. Authors: Gavin Smith, David Perkes, Andy Rumbach, and Darrin Punchard.

Floodplain Buyouts: An Action Guide for Local Governments on How to Maximize Community Benefits, Habitat Connectivity, and Resilience. 2017. Environmental Law Institute, Washington, D.C.

Professional Practice: Resilient Design. 2016. See: https://www.asla.org/resilientdesign.aspx. Authors: Aaron King, Jarod Green.

A Procurement Guide for Nature-Based Solutions. 2008. The Nature Conservancy. See: http://nrcsolutions.org/wp-content/uploads/2018/02/NBS_Procurement_Guide.pdf. Authors: Valerie A. Leung, Nathan Woiwode, and Mark P. Smith.

Managed Retreat Toolkit. Georgetown Climate Center. See: https://www.georgetownclimate.org/adaptation/toolkits/managed-retreat-toolkit/introduction.html. Authors: Katie Spidalieri and Annie Bennett.

Property Acquisition Handbook for Local Communities. A Summary for States. October 1998. See: https://www.fema.gov.

Lead with Listening – Climigration. See: http://www.climigration.org.

Naturally Resilient Communities. Using Nature to Address Flooding. See: https://nrcsolutions.org.

Appendix 3: Guide Development

The methods used to develop this guide include the review of documents, the identification and assessment of case studies, and input provided by members of an advisory board.

Document Review

First, we reviewed several types of documents, including: 1) open space management cases associated with FEMA-funded buyouts from across the country, 2) federal and state agency documents as well as non-profit materials describing the open space management process, and 3) the academic literature focused on buyout-related open space management issues. The review of these documents helped to identify important issues that are covered in the guide, including those materials that are lacking in other documents. The research uncovered three areas that needed clear attention: 1) a set of steps required to proactively plan and implement an open space management strategy, 2) a discussion of open space management issues and options based on local needs and conditions, and 3) a description of how land use planning and landscape architecture techniques can be applied, recognizing FEMA buyout policy and rules. Identified topics were addressed using call-out boxes, tips, matrices, process diagrams, checklists, and case studies.

Case Study Analysis

The research team conducted a national review of buyouts, focusing on those projects where an open space management strategy was completed or under development. FEMA and state “success stories” documents, local government plans and reports, media articles, and other materials were used to identify prospective cases. This resulted in the initial identification of 59 potential cases, spanning all 10 FEMA regions. Each case was reviewed and compared to key thematic areas and subcategories the research team deemed important based on the review of the practice and academic literature, a national review of open space management activities, and recognized steps in landscape architecture design processes. Selection criteria also emphasized geographic diversity (spanning FEMA regions); rural, urban, and suburban sites; and the size of the community. Thirteen case studies were selected for inclusion in the guide spanning identified themes and subcategories. Themes were aligned with broader elements discussed in the open space management process diagram, whereas subcategories address important open space management issues identified in the literature. Themes include site design, community needs assessment, implementation, maintenance, and land planning. Subcategories include memorialization, environmental justice, environmental design, multi-objective planning, conveying complex funding structure, creative funding strategies, assistance from committed partners, neighborhood parks, ecological restoration, diverse partnerships, and applying FEMA's community rating system.

Advisory Board

The guide’s development was also informed by input provided by federal, state, and local officials responsible for the administration of buyout programs; private sector design consultants who have developed and helped implement award-winning open space management plans; representatives from relevant professional associations; university faculty and researchers who have assisted communities develop open space management strategies and studied buyouts and open space management issues; and non-profit organizations like land trusts who are playing an increasing role managing buyout lands. The experts, listen in Appendix 4, helped to identify important topics, assess readability and the usefulness of the materials, and provide general feedback on the guide’s content.

Appendix 4: Advisory Board

Brian Willsey – Hazard Mitigation Specialist, Federal Emergency Management Agency, headquarters.

Tim Troutman, P.E., CFM – Flood Mitigation Program Manager, Charlotte/Mecklenburg County Stormwater Services. Nationally recognized floodplain manager and administrator of federally and locally funded buyouts, including activities associated with open space planning and management.

Chad Berginnis, CFM – Executive Director, Association of State Floodplain Managers. Former State Hazard Mitigation Officer in Ohio.

Elyse Zavar, Ph.D. – Assistant Professor in the Department of Emergency Management and Disaster Science at the University of North Texas. Dr. Zavar has written extensively about sub optimal open space management results and commemoration of buyout lands.

Sherri Brokopp-Binder, Ph.D. – Lead researcher and president of BrokoppBinder Research & Consulting. Nationally recognized scholar who has written extensively about buyout policy.

Alex Greer, Ph.D. – Associate Professor in the College of Emergency Preparedness, Homeland Security and Cybersecurity at the State University of New York at Albany. Nationally recognized scholar who has written extensively about buyout policy.

Samuel Kornegay – Deputy Director, Lenoir County, NC Emergency Services. Leading buyout efforts in Lenoir County, North Carolina, including the development of open space management strategies.

Kofi Boone, FASLA – University Faculty Scholar and Joseph D. Moore Distinguished Professor, Department of Landscape Architecture and Environmental Planning, North Carolina State University. Nationally recognized expert in landscape design and equity.

Chuck Flink, FASLA – Professor of Practice, Department of Landscape Architecture and Environmental Planning, North Carolina State University. Author of Greenways. A Guide to Planning, Design and Development, and Trails for the Twenty First Century. Developed Greenway Plan for Grand Forks, North Dakota following the 1992 flood. Wrote Grand Forks, ND case study in this guide.

Jim Schwab, FAICP – Former Manager of the American Planning Association's Hazards Planning Center, Past Chair of APA's Hazard Mitigation & Disaster Recovery Planning Division and Principal, Jim Schwab Consulting, LLC. Nationally recognized hazard mitigation and disaster recovery planning practitioner.

Jae G. Park, Ph.D., CFM – AECOM Vice President, Risk Management & Resilience. Lead consultant for FEMA's HMA Assistance programs. Former HMA grants management coordinator, North Carolina Division of Emergency Management.

Douglas Nam Le, AICP – Hawaii County Disaster Recovery Officer. Led the buyout program following the 2018 Kilauea eruption. Former Deputy Director of the Climate Policy and Program's Office of the Mayor of New York City.

Chris Canfield – Executive Director, The Conservation Trust for North Carolina. Actively involved in applying land trust insights to the use of FEMA-funded buyout lands.

Appendix 5: Open Space Management Team Template

The Open Space Management Team Template is intended to document and track the actions of those involved in the open space management process to make sure the range of actions are appropriately assigned, temporally coordinated, and monitored over time, to include holding individuals and organizations accountable.

Name of Team Member	Organization	Roles and Task Assignment	Order of Task	Date Completed

Appendix 6: Open Space Management Resource Matrix

The Open Space Management Resource Matrix is intended to link the members of the open space management team to specific tasks and the resources required to achieve them. Other actions and subtasks may be added to the matrix based on local needs and conditions. Fill in cells for each category with team members you have identified. Indicate if they will help with Funding, Technical Assistance, or Policy, and list those resources by name, if possible. A "notes" column is provided in order to allow you to capture additional contextual information that may assist other members of the team. Completing this task should help identify the resources needed to assist with all aspects of open space management and to assign team members responsible for their acquisition and management.

OPEN SPACE MANAGEMENT RESOURCE MATRIX

		Funding	Technical Assistance	Policy	Notes
LAND PLANNING	Community Engagement				
	Land Suitability Analysis				
	Land Use Options				
	Implementation Strategies				
	Fundraising				
SITE DESIGN	Community Engagement				
	Advanced Planning				
	Schematic Design				
	Design Development				
	Construction Documentation				
	Permitting				
IMPLEMENTATION	Project Reporting and Fiscal Oversight				
	Construction, Administration, and Monitoring				
	Mobilization and Site Preparation				
	Demolition, Construction, Oversight				
	Final Review and Certification				
	Funding Identification				
	Closeout and Review				
	Delegation of Management and Maintenance Roles				
	Monitoring				
	Regulatory Compliance				
	Quality Assurance				
	Maintenance				

Appendix 7: References

Baker, C. K., Binder, S. B., Greer, A., Weir, P., Gates, K. 2018. Integrating community concerns and recommendations into home buyout and relocation policy. *Risk, Hazards, Crisis, and Public Policy* 9: 455-479.

Ben Dor, T. K., Salvesen, D., Kamrath, C., and Ganser, B. 2020. Floodplain buyouts and municipal finance. *Natural Hazards Review* 21(3): 1-17.

Binder, S. B., Greer, A. 2018. Exploring the role of implementing agencies in home buyouts: Process, equity, and inclusion in program design and implementation. Accessed September 14, 2020. https://hazards.colorado.edu/quick-response-report/exploring-the-role-of-implementing -agencies-in-home-buyouts-process-equity-and-inclusion-in-program -design-and-implementation.

Bloyer, K. (August 16, 2022). ASAP and CRC launch ready-to-fund resilience toolkit. Adaptation Professionals. Retrieved October 4, 2022, from https://adaptationprofessionals.org/ready-to-fund-resilience-toolkit/

Branco, A. March 28, 2022. The role of land trusts in FEMA-funded buyouts. Presented at the innovations in buyouts: From concept to completion workshop. Leveraging nontraditional partnerships: Conservation and housing/ community development organizations. New York Chapter of The Nature Conservancy.

Brand, D., Nicholson, H. 2016. Public space and recovery: Learning from post-earthquake Christchurch. *Journal of Urban Design* 21(2): 159–176.

Coastal Dynamics Design Lab, 2019. Floodprint. Lumberton, North Carolina: Strategies for resilient and usable open space. North Carolina State University, Coastal Dynamics Design Lab, Raleigh, North Carolina.

State of Colorado. Planning for hazards: Land use solutions for Colorado. Denver, Colorado: Colorado Department of Local Affairs.

Conrad, D., MCnitt, R., Stout, M. 1998. Higher ground: A report on voluntary buyouts in the nation's floodplains. A common ground solution serving people at risk, taxpayers, and the environment. National Wildlife Federation, Washington, D.C.

David E., Mayer, J. 1984. Comparing costs of alternative flood hazard mitigation plans: The case of Soldiers Grove, Wisconsin. *American Planning Association Journal* 50(1): 22–35.

Design Workshop. 2016. Landscape architecture documentation standards: Principles, guidelines, and best practices. 1st Edition. Hoboken, New Jersey: Wiley.

de Vries, D. H., Frasier, J. C. 2012. Citizenship rights and voluntary decision making in post-disaster US floodplain buyout mitigation programs. *International Journal of Mass Emergencies and Disasters* 30(1): 1–33.

Elliott, J. R., Brown, P. L., Loughran, K. 2020. Racial inequities in the federal buyout of flood-prone homes: A nationwide assessment of environmental adaptation. *Socius* 6:1–15.

Environmental Law Institute. 2017. Floodplain buyouts: An action guide for local governments on how to maximize community benefits, habitat connectivity, and resilience. Environmental Law Institute, Washington, D.C.

FEMA. 2019. Hazard mitigation assistance loss avoidance study summaries. Washington, DC: FEMA.

Flink, C. A. 2020. The greenway imperative: Connecting communities and landscapes for a sustainable future. University of Florida Press, Gainesville, Florida.

Fraser, J., Elmore, R., Godschalk, D., Rohe, W. 2003. Implementing floodplain land acquisition programs in urban localities. The Center for Urban and Regional Studies, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Freudenburg, R., Calvin E., Tolkoff, L., Brawley D. 2016. Buy-in for buyouts: The case for managed retreat from flood zones. Lincoln Institute for Land Policy, Washington, D.C.

Hanso, K., Lemanski, U. 1995. Hard earned lesson from the Midwest floods: Floodplain open space makes economic sense. *River Voices* 6(1): 16-17.

Harris County Flood Control District. (n.d.). Retrieved March 2, 2022, from https://www.hcfcd.org/About

Harris, C. W., and Dines, N. T. 1998. Time-saver standards for landscape architecture. New York: McGraw-Hill Education.

Highfield, W., Kayode, A., Brody, S., Shepard, C., Verdone, L. 2019. Strategic property buyouts to enhance flood resilience: Creating a model for flood risk reduction, community protection and environmental restoration. The Nature Conservancy, Washington, D.C.

Hino, M., Field, C. B., Mach, K. J. 2017. Managed retreat as a response to natural hazards risk. *Nature Climate Change* 7: 364–370.

Holland, Z. Breaking the debris cycle: The case for deconstruction. Philadelphia: The McHarg Center, University of Pennsylvania.

International Monetary Fund - Homepage. (n.d.). IMF. Retrieved July 13, 2022, from https://www.imf.org/en/Home

Kibert, C. L., Languell, J. L. 2013. Implementing deconstruction in Florida: Materials reuse issues, disassembly techniques, economics, and policy. Tallahassee: Florida Center for Solid and Hazardous Waste Management.

Kihslinger, R., Salvesen, D. 2017. Floodplain buyouts: An action guide for local governments on how to maximize community benefits, habitat connectivity, and resilience. Environmental Law Institute, Washington, D.C.

Knipp, B. (2018, February 5). Harris County officials work to increase access to green space, such as parks, trails in the Lake Houston area. Community Impact. https://communityimpact.com/houston/news/2018/02/05/harris-county-officials-work-increase-access-green-space-parks-trails-lake-houston-area/

LaGro, J. A. 2013. Site analysis: Informing context-sensitive and sustainable site planning and design. Third Edition. Hoboken, New Jersey: Wiley.

MacDonald, J. 2010. Charlotte-Mecklenburg County, North Carolina. In Hazard mitigation: Integrating best practices into planning. James C. Schwab, ed. Pp. 74-86. Chicago, Illinois: American Association Press.

Mach, K., Kraan, C., Hino, M., Siders, A. R., Johnson, E. A., Christopher B., Field, C. B. 2019. Managed retreat through voluntary buyouts of flood-prone properties. *Science Advances* 5: 1-9.

Marsh, W. 2010. Landscape planning: Environmental applications, 5th Ed. Hoboken, New Jersey: Wiley.

Nguyen, C. N. 2020. Homeowners' choice when the government proposes a managed retreat. *International Journal of Disaster Risk Reduction* 47. https://doi.org/10.1016/j.ijdrr.2020.101543.

Patton, A., Chakos, A. 2009. Community-based hazard mitigation case studies. In: Bullock J. A., Haddow G. D., Haddow K. S. (eds) Global warming, natural hazards and emergency management. CRC Press, Boca Raton, Florida, pp. 84–110.

Pinter, N., Rees, J. C. 2021. Assessing managed flood retreat and community relocation in the

Midwest USA. *Natural Hazards* 107:497–518. https://doi.org/10.1007/s11069-021-04592-1.

Peterson, K., Apadula, E., Salvesen, D., Hino, M., Kihslinger, R., & BenDor, T. K., 2020. A Review of Funding Mechanisms for US Floodplain Buyouts. *Sustainability* 12(23), 10112. https://doi.org/10.3390/su122310112

RSMeans. 2022 Site Work and Landscape Costs, 41st Ed. Gordian.

Schwab, J. C. 2021. After the Buyout: Managing Land in the Floodplain. *Zoning Practice*. Issue Number 4. April. Chicago, Illinois: American Planning Association.

Schwaller, N. L., Campbell. L., Nguyen, M. T., Smith, G. 2022. (Mis)trusting the process: How post-disaster home buyout processes can degrade public trust. *Natural Hazards* 111: 2681–2702. DOI: 10.1007/S11069-021-05153-2.

Smith, G., Perkes, D., Rumbach, A., Punchard, D. 2014. Living with the Saint Vrain. Lyons, Colorado: Designing a more resilient future. *Community Planning Assistance Team Report.* Chicago, Illinois: American Planning Association.

Smith, G., Saunders, W., Vila, O., Gyawali, S., Bhattarai, S., Lawdley, E. 2021. A comparative analysis of hazard-prone housing acquisition programs in United States and New Zealand communities. Special issue on managed retreat and environmental justice. *Journal of Environmental Studies and Sciences* 11(3): 392-403. Perspectives on Managed Retreat: Environmental Justice and Beyond. Siders, A. R. and Ajibade, J. Editors. DOI 10.1007/s13412-021-00689-y.

Smith, G., Nguyen, M. 2021. University-public partnerships for disaster recovery: Promoting community resilience through research, teaching, and engagement. *Journal of Community Engagement and Scholarship* 14(1): Article 4. https://digitalcommons.northgeorgia.edu/jces/vol14/iss1/4.

Smith, G., Saunders, W. 2022. A comparative review of hazard-prone housing acquisition laws, policies and programs in the United States and Aotearoa New Zealand: Implications for improved practice. Chapter 15, pp. 250-269. In *The Cambridge Handbook of Disaster Law and Policy*. Susan Kuo, John Travis Marshall, and Ryan M. Rowberry eds. Cambridge Press.

Zavar, E., Hagelman, R. 2016. Land use change on U.S. floodplain buyout sites, 1990-2000. *Disaster Prevention Management* 25 (3): 360–374. https://doi.org/10.1108/DPM-01-2016-0021.

Zavar, E. 2019. An analysis of floodplain buyout memorials: Four examples from central U.S. floods of 1993–1998. *GeoJournal* 84: 135-146.

NC STATE
UNIVERSITY